OCTOBER • 1956

NLGI Spokesman

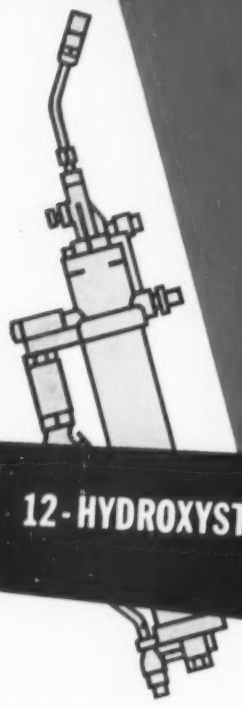
Journal of National Lubricating Grease Institute

24th annual meeting
national lubricating grease institute
october 22-24, 1956
edgewater beach hotel, chicago

- highway safety
- technical
- marketing

NLGI'S 24th Annual Meeting—Oct. '56...pages 8-14

Baker



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President's page

by W. M. MURRAY, President, NLGI

TOO MANY CHIEFS?

You know the old sachem's philosophical remark about there being "too many chiefs" and not enough indians. If the author of that observation was a good chief he was misquoted. Trouble does not lie in "too many chiefs." I agree that it may be caused by the lack of a sufficient number of good indians, but no more so than by the lack of a sufficient number of good chiefs. Recognizing quality, not numbers, we can't have too many good chiefs any more than we can have too many good braves.

The progress of our leaders lies in the strength of NLGI

NLGI has a fine reserve of excellent braves in membership, editorial contributors, SPOKESMAN readers, advertisers and in other loyal supporters, including an excellent executive secretarial staff. The strength of our organization lies in this ample pool of good warriors from which may be obtained leaders par excellence. With a large reserve of A-1 braves, we will continue to constantly improve NLGI management. Good management is regarded as a superior recruiting means for good members. Management, to me, includes committeemen, speakers and authors, and our very productive technical group as well as officials.

Man has usually crawled before he walked. There is a definite preparation for leadership that includes participation in general affairs, and every good indian takes a most important step forward when he begins his walk to his rightful place in tribal council. NLGI forums and discussions and publications are the concern of all of us. Possibly the worst enemy to progress is apathy with resulting attrition. We have continuous need for revived interest and for new blood. At times it may be necessary to discard modesty to identify oneself as a good brave. No member should ever be satisfied to hold back on questions and recommendations either orally or in writing. Keep in mind the fact that we can only maintain good progress through the generous participation of members in Institute affairs.

I have really enjoyed the privilege of addressing you each month via the President's Page. I have had quite a few comments from readers and many of the comments were favorable to thoughts expressed. I appreciate the interest shown. This message completes my series and I close with best wishes to all of my associates and friends.

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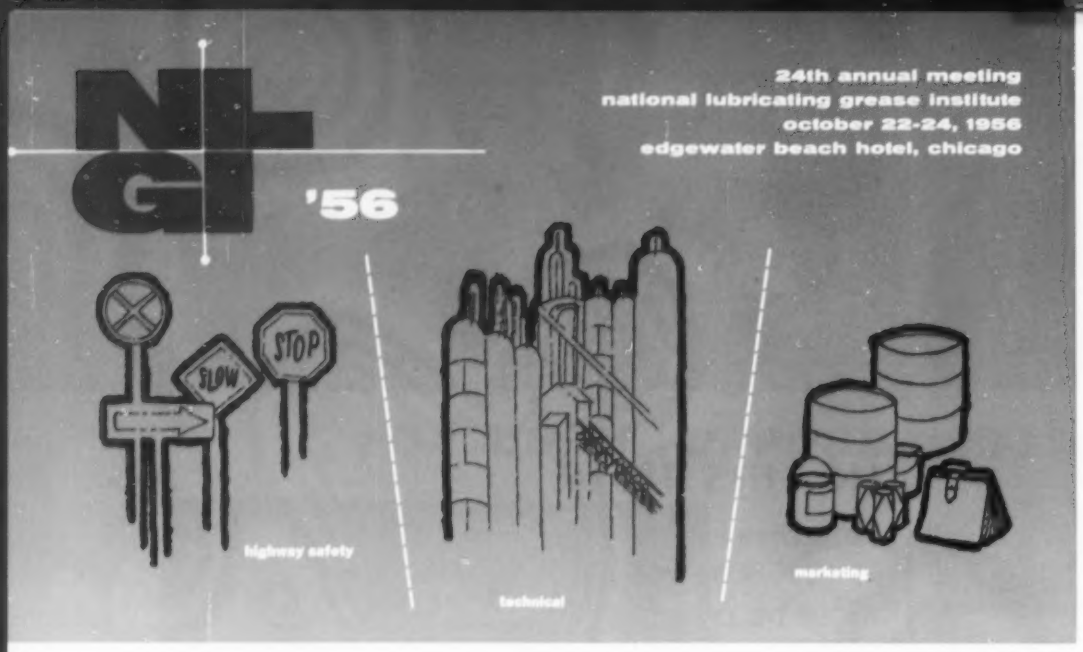
ABOUT THE COVER

This month's cover depicts three timely subjects on the agenda of NLGI's 24th Annual Meeting—highway safety—technical—marketing.

Chrysler Corporation's James C. Zeder will keynote the opening session with his belief that "Safety on the Highways Is Everybody's Job," to be followed by a panel discussion on the subject and then a marketing symposium.

Turn to page eight for a close-up of the speakers, and abstracts on the variety of technical material to be presented.



Annual Meeting Program

MONDAY, OCTOBER 22

8:30-10:00 a.m. Registration

10:00 a.m. Address of Welcome—W. M. Murray, President, NLGI
Safety on the Highways Is Everybody's Job—J. C. Zeder, Chrysler Corporation

2:00 p.m. Panel Discussion—Highway Safety

3:30 p.m. Marketing Symposium

4:45 p.m. Annual Business Meeting

TUESDAY, OCTOBER 23

9:00 a.m. Forum—Lubrication of Ball Bearings

11:30 a.m. Manufacture of Lithium Soap Grease and Calcium Soap Grease by Electric Heating—D. F. Rhodes, Canadian Oil Co., Ltd.

2:00 p.m. Metal Carbonates Coated with Salts of Low Molecular Weight Polycarboxylic Acids as Grease Thickeners—E. W. Nelson, W. W. Woods, C. R. Bergen, W. P. Scott and R. M. Tillman, Continental Oil Co.

Molybdenum Disulfide as a Grease Additive—E. F. Smith, Climax Molybdenum Co.

Pumpability, Stability and Sealing Ability of Certain Lubricating Greases of Different Type Soaps—W. A. Magie II, Magie Bros. Oil Co.

A New Synthetic Thickener for Multipurpose Lubricating Greases—J. L. Dreher, B. W. Hotten and C. F. Carter, California Research Corp.

5:45 p.m. Social Hour

6:45 p.m. Banquet—Address: Atomic Energy—Weapon for Peace— Professor H. M. Alyea, Frick Chemical Laboratory

WEDNESDAY, OCTOBER 24

9:00 a.m. Technical Committee Session—Chairman, T. G. Roehner

Zeder

Safety on The Highways Is Everybody's Job

By J. C. ZEDER, Chrysler Corporation

An "engineer's engineer" describes James C. Zeder, a vice-president and director of engineering and research, and special adviser to the president of Chrysler Corporation. Zeder has been associated with Chrysler since its founding in 1925. He received a mechanical engineering degree from the University of Michigan in 1922 and went to work for the Maxwell Motor Company which became the Chrysler Corporation three years later.

Zeder's first position at Chrysler was as head of the mechanical laboratory, and later he became chief engineer of the newly-formed Plymouth and DeSoto division. When the company formed an engineering board in 1946, Zeder was made its chairman. He was appointed director of engineering and research in 1950 and elected a vice-president of the corporation and a member of the board of directors in 1951.

He is a past national president of the Society of Automotive Engineers, a former director and vice-president of the Engineering Society of Detroit, and a founder and former chairman of the SAE technical board.

Starr

PANEL DISCUSSION— Highway Safety

Chairman DR. J. V. STARR, Esso Standard Oil Company

Dr. John V. Starr of Esso Standard Oil Company has held the position of assistant manager of the lubricants & specialties division since 1951.

He is a native of Indiana and a graduate of Wabash College. From Wabash College Dr. Starr went to Cornell University where he taught and received his Ph. D. in industrial chemistry. Dr. Starr then went to work for the Esso Company as a chemist in the research and development department. He was soon promoted to the position of manager of the technical service division, and then to technical assistant to the general manager of East Coast manufacturing operations.

Dr. Starr is currently a member of the board of directors of the National Lubricating Grease Institute.

Gandelot

Techniques for Vehicle Safety Testing

By H. K. GANDELOT, General Motors Corp.

Howard Gandelot has been a member of the General Motors engineering staff since 1940. For the past 10 years he has been engineer in charge of the General Motors vehicle safety section.

After graduating from Carnegie Tech in 1917 he joined Oldsmobile and, except for one and a half years of pilot training in the U. S. Air Force during World War I, continuously has been connected with the automotive industry, specializing for a number of years in brake development.

He has been a member of SAE for 35 years, is past chairman of the Detroit Section ASME, and a member of several other engineering societies. He is on General SAE Seat Belt Committee and serves as chairman of the AMA Subcommittee on Vehicle Safety.

Abstract

Vehicle safety testing will be described by Gandelot narrating a motion picture comprised of a series of short sequences of actual tests. Starting with some of the very early rol-over test techniques the film will show later types of rol-over crashes, a car-to-car crash impact test, barrier crash tests and a subsequent technique developed for simulating impact deceleration by means of a large snubbing apparatus capable of producing deceleration rates on the test vehicle of up to 30 gs.

Ashworth

Traffic Safety Through Enforcement

By RAY ASHWORTH, Northwestern University

Ray Ashworth began his professional career with the Wichita Police Department in 1928. He was acting chief of the department, when he took leave to become a field representative and one of the original staff members of the Traffic Institute and

IACP Traffic Division. He has served as Chief of Police of San Antonio, Texas, and of Houston, Texas.

He served throughout World War II in Europe and the Pacific.

Since that time he has been chief of the inspection and investigation division of the Veterans Administration regional office in Dallas, and chief of the public safety branch of the U. S. Office of Military Government in Berlin. He returned to the Traffic Institute and the Traffic Division of the IACP in 1955 as Executive Assistant to the Director, and is presently Acting Director of the Institute and the IACP Traffic Division.

Abstract

Highway safety depends greatly upon effective traffic law enforcement, aimed at prevailing accident causes. Fair and efficient police and court action is needed, plus cooperation from other agencies and from the public. This must be part of an overall program to restrict new rises in the mileage death rate, particularly in rural areas.

Spottke

A Four Point Program to Cut Highway Accidents

By A. E. SPOTTKE, Allstate Insurance Company

A. E. Spottke is vice president of Allstate Insurance Company. He began his career in 1926 with the National Bureau of Casualty Underwriters, where he was manager of the automotive division from 1932 to 1946. In 1946 he was named secretary. Spottke accepted the position of vice president and manager of the New York office of the Massachusetts Bonding and Insurance Company in 1948. Two years later he joined Continental Casualty Company as vice president and director. He became vice president of Allstate in 1952.

Abstract

The automobile insurance industry which is a four and a half billion dollar business has a big stake in highway safety with losses currently exceeding the three billion dollar mark. As businessmen, all of us can do certain things right now to work for better conditions. There are three important aids. First, support the organization of citizens' traffic safety projects at the local and state levels. Second, see that all high school students receive driver training as a part of school curriculum. Next, sound enforcement of traffic laws must be developed. And finally, be sure the road program moves along well and rapidly by clearing the path of misconceptions and possible local objections which cause delay.

Simonds

The Service Station And Motorist Safety

By J. E. SIMONDS, Esso Standard Oil Company

James E. Simonds is director of marketing training of Esso Standard Oil Company. A native of New Orleans, he attended military school in the South and the University of Chicago.

He has held a variety of positions in the marketing departments of Socony-Mobil Oil Co., Inc. and Esso Standard Oil Company from junior salesman through manager of service operations, merchandising, service station selection and development, and dealer training. He was training supervisor in Esso's New England division prior to his present home office position.

Abstract

Both the service station dealer and his supplier attach a dollar sign to "safety" as a benefit the motorist obtains in many products and services. They also recognize a moral responsibility for the highway safety of the motorist, and they both do something to fulfill it—the dealer, by exerting extra and sincere effort to observe and inform, and the supplier of lubricants, by training the dealer and employees. Safeguarding the motorist against hazards of his machine, the road, and his own behavior, depends on opportunities to sell and good salesmanship when they arise. Profit is a result, but it is not a "quick buck." It is good will.

Hart

MARKETING SYMPOSIUM

Chairman F. R. HART, Standard Oil (California)

F. R. Hart chairmans the marketing symposium with the authority of thirty-eight years in the marketing department of Standard Oil Company of California. His present title of senior specialist, industrial lubricating oils and greases for the seven Western states and the territories of Hawaii and Alaska is one of potent activity. He is responsible for prices, packages, product distribution, development and prosecution of sales programs, complaint

analysis, new product development, approval of advertising copy, and all other matters appertaining to the sales of a complex line of industrial oils and greases. Hart is currently a director of the board of the National Lubricating Grease Institute.

Randak

Analyzing the Lubricating Grease Market

By A. S. RANDAK, Sinclair Refining Company

A. S. Randak is Sinclair Refining Company's manager of technical service. He was first employed by the company in 1937 as diesel engineer in railway sales department, and later as chief automotive engineer in lubricating sales.

Randak graduated from Purdue University with a bachelor of science and masters in engineering in 1934. His first employment was with Union Pacific Railroad. He served with the Air Force during World War II.

Randak is a member of SAE, ASTM, NLGI, ASME & ASLE.

Abstract

Conservative estimates indicate a 50 per cent increase in lubricating grease demand by 1965 over 1955 consumption. The consumption of grease per unit machine has been steadily declining and the projected increase is entirely due to the tremendous increase in equipment inventory. Normal evolution and concentrated efforts of design engineers are in the direction of eliminating existing grease lubrication for many applications. The industry needs to give serious consideration to unified action toward creating new applications and markets for grease products.

Rising costs require close study of grease markets by manufacturers and marketers to assure economic justification of new product developments.

Flanagan

Preparing the Sales Program

By J. H. FLANAGAN, Standard Oil of Indiana

J. H. Flanagan joined Standard Oil Company of Indiana in 1930, and since 1938 has been the company's merchandise manager in motor oils and automotive lubricants. Flanagan's beginning years were with the departments of sales engineering and market research.

A graduate of Michigan State University, Flanagan received his degree in chemical engineering in 1924. Before joining Standard, Flanagan worked in the metallurgical department of Chicago Pneumatic Tool Company and the industrial sales of E. F. Houghton Company.

Abstract

A sales program is prepared in outline form describing a wide coverage of marketing activity. Reviewed in the outline are: a brief history of marketing, sales personnel involved, sales aids used, sales literature, timing of sales programs, direct influencing factors, adequate product stocks, program announcement letter, follow-up sales letters and interest stimulating product sales meetings.

Gore

Selling Customer Benefits

By C. E. GORE, Battenfeld Grease & Oil Corporation

Charles E. Gore is sales manager of the Battenfeld Grease & Oil Corporation. He joined Battenfeld several years ago and after an extensive training program was appointed southern sales representative, before attaining his present position.

A graduate of the Marine Corps Institute, Gore completed an extensive tour of duty during World War II and then entered the automotive parts field as a salesman. He rapidly became a top volume producer and was brought into the office as sales supervisor. Gore then joined a national retail marketing organization to become sales manager in the retail division, before joining Battenfeld.

Abstract

Lubricating greases are important to a petroleum marketer completely out of proportion to the dollar or gallon volume realized from their sale.

The prestige value of grease is tremendously important as often the entire line of a marketer's products are judged on the appearance and performance of his lubricating grease alone.

The only successful way to sell the customer on the benefits of a particular product is through the first line of contact—the bulk wagon driver or consumer salesman.

Therefore the importance of adequate, practical training cannot be over emphasized.

Adequate training can be gained without highly technical information and as a matter of fact, more basic, down to earth information is to be desired.

The actual method should consist of positive product information on your own particular lubricants.

Leland

FORUM— Lubrication of Ball Bearings

By DR. H. L. LELAND, Esso Research & Engineering

Dr. Hollis L. Leland is head of the marketing technical section of Esso Research & Engineering Company, products research division. He is a graduate of Maine University, received his master's degree in chemistry from the University of New Hampshire and his Ph.D. from Ohio State University in the field of physical chemistry.

Leland joined Esso in 1937, working principally in research and product development on lubricants until this year. He served as section head on lubricants and section head on industrial oils and greases. His memberships include SAE, ACS, and ASLE.

Predicting the high temperature performance of lubricating greases from laboratory bench tests
By J. L. Dreher, California Research Corp.

The influence of base oil characteristics on the performance of anti-friction bearing greases
By Harold A. Woods, Shell Oil Company

The influence of the physical and chemical properties of anti-friction bearing greases on their operating characteristics
By Dr. A. A. Schwartz, General Electric Company

Current problems in grease lubrication of ball bearings
By C. H. Hannon, Fafnir Bearing Company

Problems associated with ball bearing operation at high temperatures and/or high speeds
By Heinz Hanau, General Motors Corp.

Rhodes

Manufacture of Lithium Soap Grease and Calcium Soap Grease by Electric Heating

By D. F. RHODES, Canadian Oil Company, Ltd.

D. F. Rhodes, who will describe two outstanding grease products of Canadian Oil Companies, Ltd., is that company's assistant to manager of manufacturing at the Sarnia refinery. Starting with Canadian Oil in 1936 as a chemist, he achieved the position of chief research chemist in 1951.

Rhodes is a graduate of Sarnia Technical School and McMaster University. His field was mathematics and physics. Postgraduate work was done at Western Reserve University and McGill University. Rhodes' professional affiliations include the Chemical Institute of Canada, SAE, ASTM, Checkchart Advisory Board of Engineers and the Engineering Institute of Canada.

Abstract

The evolution of Canadian Oil Companies, Limited grease business has resulted in the present sale of chiefly two products e.g. a calcium soap "pressure gun" grease and a lithium soap "Multi purpose" grease, which are described.

These two lubricants represent the major portion of Canadian Oil's grease sales and are the types used in the company Service Stations across Canada and or sold to Industrial Accounts. The maximum summer and winter weather conditions to which service stations in Canada are exposed are severe. The greases hereafter described have performed satisfactorily in industrial and vehicular lubrication in wet, hot and cold service. They have excellent pumpability for service station use in winter and are marketed in summer season without change or modification of consistency or mineral oil component.

Nelson

Metal Carbonates Coated With Salts of Low Molecular Weight Polycarboxylic Acids As Grease Thickeners

By E. W. NELSON, W. W. WOODS, C. R. BERGEN, W. P. SCOTT and R. M. TILLMAN,
Continental Oil Company

Woods

Bergen

Scott

Tillman

E. W. Nelson received a Bachelor's degree from Bethany College in Kansas and a Master's degree in chemical engineering from the University of Minnesota. His entire industrial career has been primarily in the field of petroleum where his specialty has been lubricating greases and cutting oils. He is a member of ACS and has been an active participant in the affairs of ASTM and NLGI where he has been a vice-chairman of the Technical Committee for the past two years.

W. W. Woods obtained his B.S. degree in chemistry from Stanford University. He spent five years in research with Socony Vacuum Oil Company and for the past six years he has been a member of the development and research department of Continental Oil Company where he is a supervising research chemist. His field of specialization is in colloid chemistry.

C. R. Bergen obtained his B.S. degree in chemistry from Bethany-Peniel College in Oklahoma. He joined the research department of Continental Oil Company upon graduation and for the past four years has devoted his time to problems relating to grease research and development.

W. P. Scott served two years in the army, after which he re-entered school and received his B.S. degree in chemistry from Northeastern State College of Oklahoma. Since joining the research department of Continental Oil Company three years ago, he has worked on specialized grease development.

R. M. Tillman received both his B.S. and M.S. degrees in chemistry from Southern Methodist University. A member of Continental's research department for the past three years, his particular field of endeavor has been in product development.

Abstract

A grease thickener is described which consists of a colloidal dispersion of a polyvalent metal carbonate which has been coated by chemical interaction with a low molecular weight polycarboxylic acid. Use of this thickener in hexa alkoxy disiloxane fluids gives greases which show promise of utility over a −100°F. to +350°F. range as aircraft lubricants. This thickener is intensive to vehicle and can also be used with other fluids to give high dropping point greases for less critical service.

Smith

Molybdenum Disulfide As a Grease Additive

By E. E. SMITH, Climax Molybdenum Company

Elwin E. Smith attended the University of Alabama studying chemical engineering from 1940-1943. He served in the U.S. Army from 1943 to 1948, as an officer in the parachute infantry. Upon his discharge, he worked as a sales engineer and chemist for Diamondhead Oil Company. In 1949 he joined Cities Service Oil Company where he successively was sales engineer for general petroleum products, sales manager for petroleum waxes and sales manager for industrial lubricants in the New York area. Smith joined Climax Molybdenum Company in 1955 as manager of lubricant development.

Smith's professional affiliations include ASLE, API, NLGI, ACS and SAE.

Abstract

The lubricating properties of molybdenum disulfide depend on its inherent low coefficient of friction and its affinity for metal. As an additive in grease subject to mechanical shock loads or wiping action, MoS_2 will form films that will sustain lubrication in the absence of hydrodynamic films. The formation and functioning of MoS_2 films are affected by particle size, grease base, purity, percent addition, and type of surface. Timken, Falex, Navy 2 hr. Wear Test, Shell 4 Ball, Wieland, Oscillating Friction and ASTM Abrasion Test, demonstrate its effectiveness in grease.

Magie

Pumpability, Stability And Sealing Ability of Certain Lubricating Greases of Different Type Soaps.

By W. A. MAGIE II, Magie Bros. Oil Company

W. A. Magie II is vice-president of Magie Bros. Oil Company. He is also president of MBI-Taleen Lubricants which is a marketing company.

A native of Chicago, he was graduated from Harvard College in 1928. He worked for a year with a bank in New York City, and returned to Chicago to enter the oil business the following year.

Magie is a member of the lubrication committee of the American Petroleum Institute and the ASLI.

Abstract

We feel that ASTM drop point alone does not properly indicate high temperature performance, by showing the comparison of static penetrations against certain pumpability of shear tests. These are conducted on several types of soap base greases at both high and low temperatures.

Dreher

A New Synthetic Thickener for Multipurpose Lubricating Greases

Hotten

Carter

By J. L. DREHER, B. W. HOTTEN and C. F. CARTER, California Research Corporation

J. L. Dreher obtained his A.B. degree in chemistry from the University of California in 1935. He was employed by General Petroleum Corp. In 1943 he joined the Metallurgical Laboratories (Manhattan Project), Chicago University. He joined Hanford engineering works (DuPont) in 1944 and California Research Corp. in 1945. He is group supervisor of the grease research and development laboratory. Dreher is a member of ACS, ASLE and American Assoc. for the Advancement of Science.

Dr. B. W. Hotten graduated from Cincinnati University in 1941 with a B.A. degree and from Purdue University in 1945 with a Ph.D. in organic chemistry. He spent an additional year at Purdue in research on organic fluorine compounds. He is a senior research chemist at California Research Corp., where he has worked since 1946, on the formulation and fundamental properties of lubricating greases. He is a member of Phi Beta Kappa, Sigma Xi, ACS and the Society of Rheology.

C. F. Carter obtained his B.S. degree from Polytechnic College of Engineering in 1934. In 1935 he was employed by California Research Corporation, operating company of the Standard Oil Company of California. For the past 16 years he has been engaged in the development and manufacture of lubricating greases. Carter is a member of ASLE.

Abstract

A new synthetic thickener for multipurpose lubricating greases is discussed. The new material is synthesized from dimethyl terephthalate and hydrogenated tallow amines. As the sodium salt, the new material thickens greases which have dropping points above 500°F and are highly water resistant, work stable, and compatible with all principal types of greases. The new thickener can be used with mineral oils and such synthetic fluids as silicones, disiloxanes, diesters, polyglycols, and phosphates. Greases have been qualified under Military Specifications MIL-L-3545 and MIL-G-18709, and preliminary tests indicate that they can be made to comply with MIL-L-7711, MIL-G-3278, and many others.

Alyea

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By H. M. ALYEA, Princeton University

Dr. Hubert N. Alyea graduated from Princeton University in 1925. Following this, he spent a year at the Nobel Institute, Stockholm, Sweden; he returned to get his Doctor's degree from Princeton in 1929. The following year was spent at the University of Minnesota studying the chemical effects of radium, and the next year at the Kaiser Wilhelm Institute in Berlin, Germany, investigating the explosion of gases. Since then he has been in the chemistry department at Princeton University. During the war he carried out research for the Office of Scientific Research and Development in Washington and in the Pacific. He is Professor of chemistry. During 1948-49 he was Visiting Professor of chemistry at the University of Hawaii. In 1950 he was given the New Jersey Science Teachers Recognition Award. His field of research is the retardation of chemical reactions, and the action of various types of radiation on these reactions.

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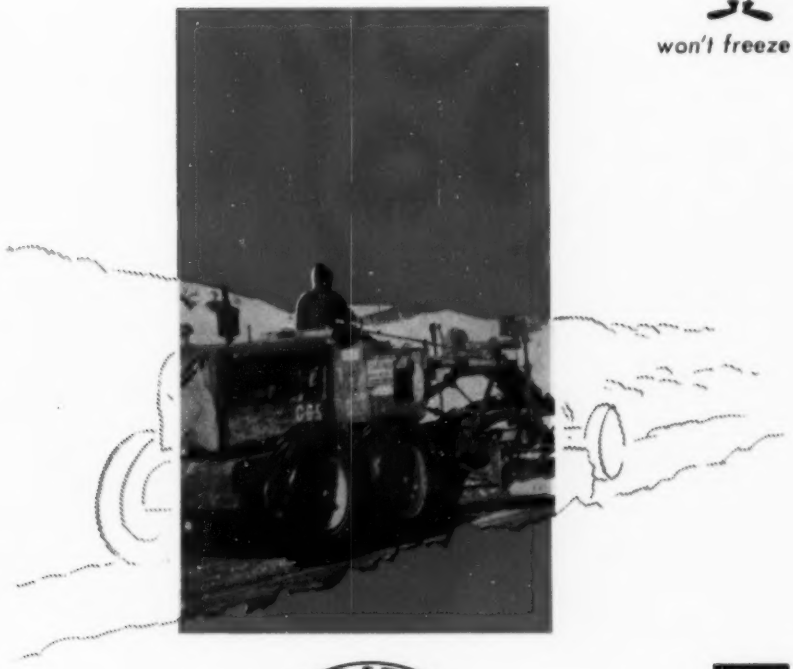

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AUTOMOTIVE GREASES and CHASSIS LUBRICATION

By Charles M. Heinen, Chrysler Corporation, Detroit, Michigan

WHEN I HAD my first look at the program that Chairman Hemmingway had prepared for the SAE Symposium on chassis lubrication, I was completely overwhelmed. Every phase of chassis lubrication that I could think of seemed more than adequately covered by experts in the field. As a matter of fact, there were several subjects that I had not thought about. The use of a rheopectic grease is a good example. Rheopectic is not listed in the dictionary, but Rheo is a combining form meaning current. Pectic is derived from any of certain water soluble substances yielding a jelly which is the basic of fruit jellies. Now I ask you, who but an expert would think of using "currant jelly" as a chassis lubricant?

I suppose it will work—just about everything else does. I can only recall two cases of service failure during the time that I have been looking at that sort of thing which was directly chargeable to the chassis lubricant. The first was a cold weather failure. The chassis lube used on the clutch torque tube fitting became so stiff in winter that the return spring could not overcome the resistance, and the clutches burned out. The second was of an entirely different type of failure. It came in the form of complaints from dealers that "oil" was dripping onto their showroom floors. This one turned out to be due to a mistake in which a batch of incorrectly labeled semi-fluid lubricant had been used.

The SAE Handbook is very general on the subject of requirements of a chassis lube:

> "Chassis Lubricant—This term designates lubricating greases of proper consistency to be applied with grease guns through grease fittings into the various parts of automotive chassis requiring grease for lubrication.
>
> *Special Notes*—(a) This should have high resistance to the washing effects of water. (b) a heavier grade of lubricant than the all-season types may be required for use in hot weather or heavy-duty service, while a lighter grade may be required for winter use in colder areas of the country."

It would appear that the problem of supplying a suitable chassis lubricant is not overwhelming.

The method of application is straightforward and common to all manufacturers of passenger cars—the grease gun and the fitting. The lubrication period is universally agreed on as 1,000 miles. Why then are we talking about this subject?

The chart, "Average number of fittings per vehicle 1946-55" may furnish a clue. In view of the fact that there is a variation in individual models depending on the type of transmission, steering, etc., it averages the condition for the least and most fittings for each car.

AVERAGE NO. OF FITTINGS PER VEHICLE 1946-55

	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
High:	21.2	22.3	22.4	24.2	24.9	26.2	25.2	22.8	22.4	21.0
Low:	20.2	21.0	21.5	23.8	24.6	23.8	22.0	20.4	20.0	17.8

From 1946 to 1951 there was a steady increase in the number of fittings used, from 1951 on there has been an equally steady drop. This, as far as I am concerned is the big story in chassis lubrication.

I indicated above that I had only heard of two complaints where the chassis lubricant was at fault. There have been dozens attributable to lack of lubrication.

Designers considering these complaints have attempted to go in the direction of permanently lubricated units, bearing materials requiring no lubrication and in some cases systems to make chassis lubrication a semi automatic function. This trend will continue unless one or more of the following steps is taken:

1. Although major improvement has been made in the equipment for lubricating chassis, it is important that this progress continue so as to reduce the present half hour's lubricating time to perhaps five minutes.

2. Further simplification of the chassis greasing operation to bring the important benefit of developing station operator's interest in soliciting this type of business and in doing a thorough job.

3. Progress in developing greases may be expected to continue. It should be aimed at new types conceived specifically for chassis lubrication so as to greatly increase the time interval between lubrication jobs.

The modern motorist demands and will get comfort in all phases of operation. A monthly half hour at the grease rack is not consistent with this demand.

Chassis lubrication as defined by this Symposium apparently includes wheel bearing greases. Perhaps later on in this discussion I may have a chance to comment on such items as corrosion resistance, compatability and separation for this very important product.

But for the moment, in order to fit in with the time schedule, I would like to leave you with the question, "What can we do to guarantee sufficient frequency of chassis lubrication?" ■

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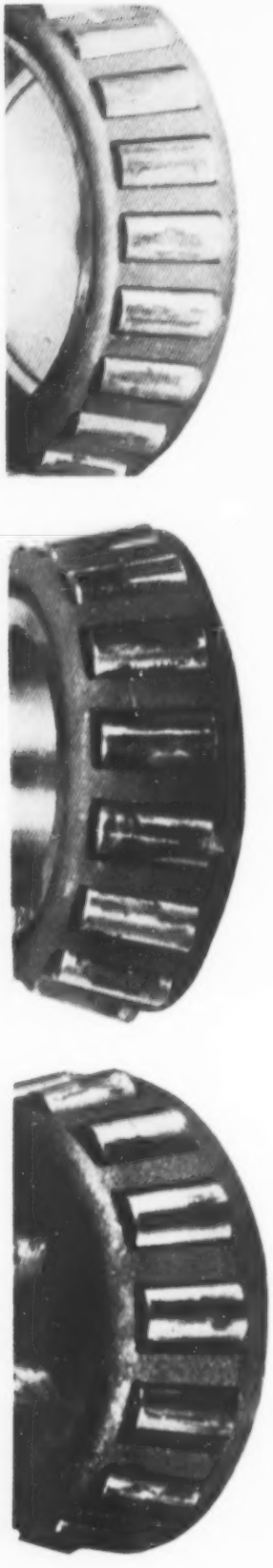


Corrosion Inhibited Automotive Greases

by J. A. Bell, Shell Oil Company

Introduction

OPERATION OF automotive equipment exposes various grease lubricated assemblies to contamination with water. Chassis parts such as shackles, kingpins and steering linkages are particularly vulnerable in this respect. Wheel bearing assemblies also may become contaminated under certain conditions. We shall endeavor in this paper to:

Illustrate the deleterious effect of water contamination on such grease lubricated assemblies.

Show that automotive greases with "built-in" corrosion inhibiting properties can considerably reduce the damage normally resulting from water contamination.

Some Aspects of Water Contamination

Not infrequently grease lubricated equipment has to operate under wet conditions. The presence of water whether intentional as in steel rolling operations, or fortuitous due to climatic or other circumstances, poses the problem of water contamination. Combating water contamination is a matter involving both the equipment designer and the lubricant supplier. The equipment designer is concerned with preventive measures, i. e. methods to preclude, or at least minimize, the entry of water into the grease lubricated assembly. On the other hand, the

***Figure* 3. Left: Section of wheel bearing cone corroded by water in service. Center: Typical corrosion obtained with glass jar bearing corrosion test. Right: Typical corrosion obtained with combined operating/static test.**

grease manufacturer must endeavor to formulate greases for such applications which will continue to provide adequate lubrication and protection against corrosion even when heavily contaminated with water. Various aspects of the problem as related to grease performance under wet operating conditions were reviewed and discussed in a paper by Messrs. Hendricks and Smith[1]. The authors concluded that appropriately formulated greases could play an important part in combating the harmful effects of water contamination.

The general requirements which specialized or multipurpose type automotive greases should meet are well known and need not be reviewed. Many excellent products are available which by present standards do a good job. However, most people have observed a deterioration in chassis lubrication coincident with prolonged wet weather operation. This is particularly noticeable in the case of heavy duty equipment and may necessitate interim relubrication in order to maintain ease of steering, etc. More important perhaps is the concurrent corrosive wear of kingpins, shackles, etc. This wear appears to result from both fretting corrosion and water corrosion. We believe water corrosion to be the predominating factor. In comparison with chassis parts water contamination of wheel bearings is relatively infrequent. Unless contamination is followed by loss of lubricant due to the grease washing out or thinning down no deleterious effects may be noted at the time. However, such contamination often results in corrosion of the bearing surfaces particularly during nonoperating periods. In the latter case, corrosion is usually concentrated in the areas adjacent to the points of contact between the rollers or balls and the races. Such corrosion produces local stress concentrations which, in the course of subsequent operation, may cause premature fatigue failure of the bearing.

This situation provides the incentive to develop automotive greases affording better protection and performance in the presence of water. Obviously, other desirable grease properties must not be sacrificed in achieving this objective.

Test Methods

Such grease development work involves the use of many laboratory evaluation tests for screening and comparing various formulations. Of these the following tests which simulate and appear to correlate with field performance were particularly useful in evaluating the protection afforded under wet conditions:

1. The oscillating friction machine (OFM) and testing technique developed by International Lubricant Corporation simulates conditions encountered in the operation of grease lubricated chassis parts.[1,2] The machine (figure 1) consists essentially of a steel journal or pin mounted in a bronze bushing which is oscillated through a 15° arc at 350 cycles per minute under a load of 500 pounds. The pin is lubricated with the test grease at the time of assembly. No grease is added during the test. The machine is operated until lubricant failure occurs, this being denoted by a marked rise in the temperature of the pin/bushing assembly. The test can be run under either dry or wet conditions. In the latter case, jets of water are directed against each end of the bushing on a two-hour on/off cycle. Figure 2 illustrates that the type of corrosion obtained with this laboratory test is similar to that observed in the field.

2. To simulate the conditions which may exist when water contamination of a wheel bearing assembly occurs, two types of bearing corrosion tests were employed: a. The bearing is rotated during part of the time it is in contact with water.

(a) The so-called glass jar bearing corrosion test introduced by our Emeryville laboratory and currently under review by the CRC (CLR Group on Airframe Lubricants) was used to evaluate water corrosion under purely static conditions. Briefly the test involves packing a Timken bearing with the test grease and rotating the greased bearing for one minute at 1,750 rpm to distribute the grease and leave only a thin film on the working surfaces. The bearing is then placed in a cosmetic jar, and either 12 ml of distilled water or 12 ml of water containing 0.05 per cent sodium chloride poured over the bearing and the jar closed. The bearing is inspected for corrosion after a suitable interval. For the tests described in this paper 14 and 5 day test periods with distilled water and aqueous 0.05 per cent sodium chloride respectively were used.

(b) Various test methods involving both operating and static periods while the bearing is in contact with water have been studied. The operating phase of the test increases the possibility of the grease film being displaced from the bearing surfaces by water. It has been found that 2 or 3 hours wet operation followed by a 24-hour static period gives significant results. A recent paper includes a detailed description of one such method.[3]

Figure 1. **Oscillating friction machine showing one of the four test units with water spray in action. New test pin and bushing shown at right of unit.**

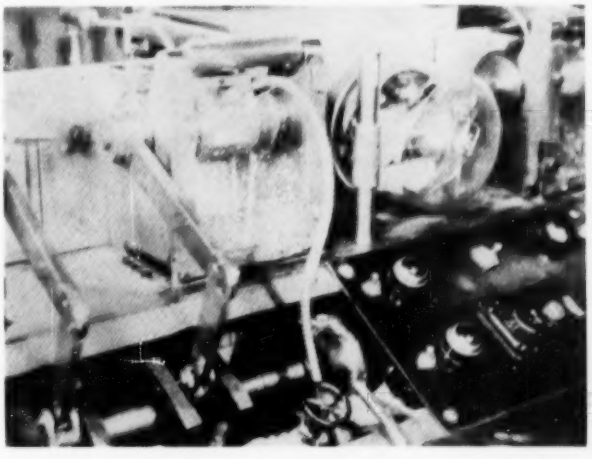


Figure 3 shows that the type of bearing corrosion obtained by both laboratory techniques is similar to that which can result from water contamination in service.

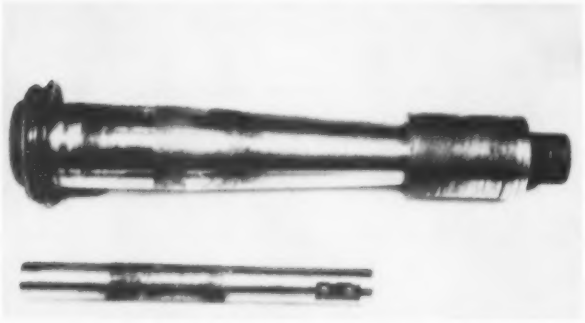


***Figure 2.* Top: King pin from city bus. Below: Typical pin from a wet OFM test showing corrosion.**

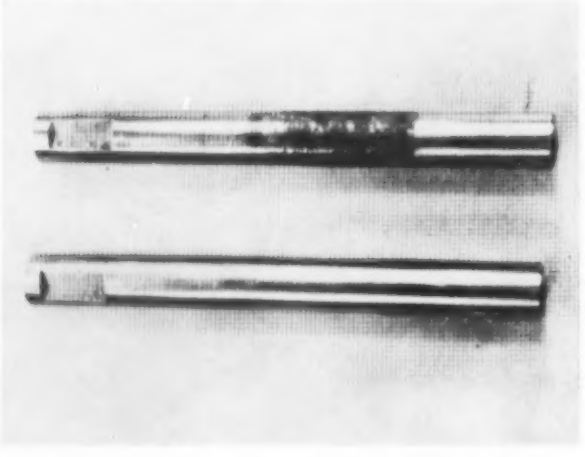
Combating Water Contamination

Our efforts to develop automotive greases affording better protection and performance in the presence of water have been concerned primarily with the multipurpose type of grease. However, during the course of these studies many specialized type products, i.e. chassis and wheel bearing greases, respectively, were evaluated by means of the above test methods for purposes of comparison. The results obtained permit making some general observations:

1. Considerably more than one hundred greases were examined in the oscillating friction machine. In each case the performance in the presence of water was significantly inferior to that obtained under dry conditions. Depending on the particular formulation wet operation reduced the life of the grease by a factor ranging from 2 to 10.

2. Under the conditions of the above bearing corrosion tests all conventional greases examined permitted some corrosion. Complete protection of bearing surfaces was obtained only with greases specifically formulated for that purpose.

***Figure 4.* Top: Pin lubricated with conventional grease after 50 hour wet OFM test. Bottom: Pin shown here was lubricated with corrosion inhibited grease after 50 hour wet OFM test.**



Comparing the performance of a conventional multipurpose automotive grease with that of a similar product containing appropriate corrosion inhibitors will serve to illustrate the possibilities this approach offers in minimizing the harmful effects of water contamination. Both greases have an NLGI No. 2 consistency and are based on lithium 12-hydroxy stearate soap and 75 S.S.U. at 210°F mineral oil. The results of OFM tests are shown in Table 1:

TABLE 1

Grease	OFM Test Hours to Failure	
	Dry	*Wet*
Conventional	360	85
Corrosion Inhibited	350	162

These data illustrate the adverse effect of water on performance. It will be noted the effective life of the corrosion inhibited grease is approximately twice that of the conventional product under wet operating conditions.

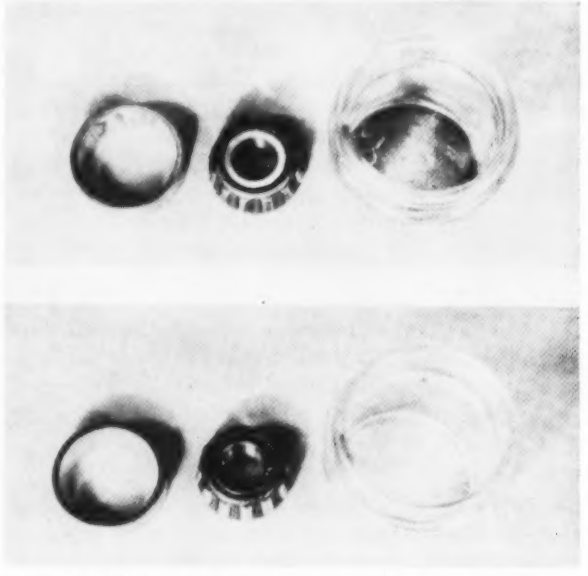


***Figure 5.* Glass jar bearing corrosion test (fourteen days—distilled water). Top: Conventional grease. Bottom: Corrosion inhibited grease.**

The results of a comparative 50-hour wet OFM test are shown in Figure 4. During this period the conventional grease permitted considerable corrosion of the pin, whereas the corresponding corrosion inhibited version afforded complete protection.

Figures 5 and 6 show the results of glass jar bearing corrosion tests; Figure 7 the result of a comparative bearing corrosion test involving both operating and static periods. In all cases the corrosion inhibited grease provides complete protection of the bearing surfaces, whereas

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considerable corrosion occurs with the conventional product.

The results of these comparative tests are summarized in Table 2:

TABLE II

	Grease	
	Conventional	*Corrosion Inhibited*
Dry OFM, hrs. to failure	360	350
Wet " " " "	85	162
Wet OFM, condition of pin at 50 hrs.	Considerable corrosion	No corrosion
Glass Jar Bearing Corrosion Test 14 days, distilled water	Considerable corrosion	No corrosion
5 days, aqueous sodium chloride, 0.05%	Considerable corrosion	No corrosion
Comparative Operating/Static Bearing Corrosion Test	Considerable corrosion	No corrosion

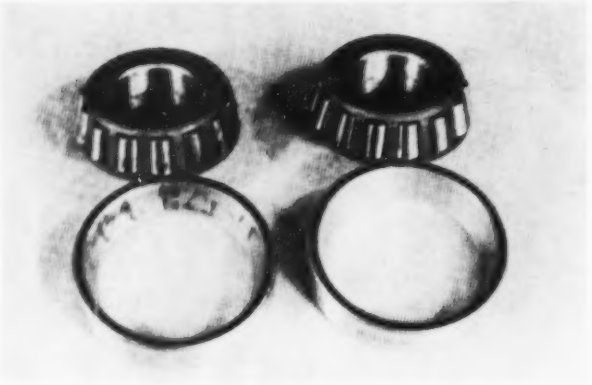

Figure 7. **Comparative corrosion test involving both operating and static periods. Left: Conventional grease. Right: Corrosion inhibited grease.**

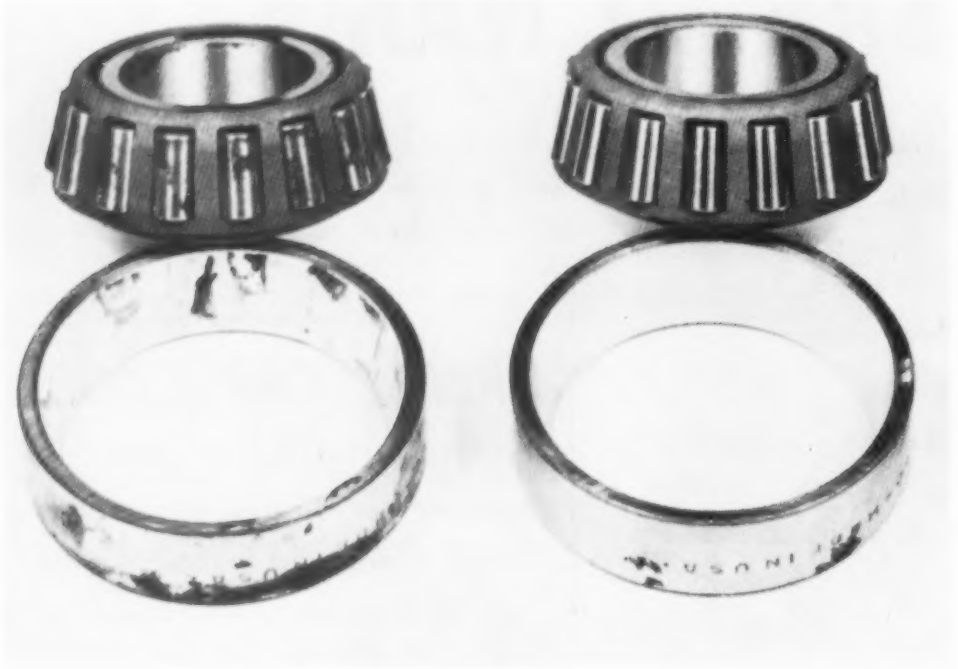

Figure 6. **Glass jar bearing corrosion test (five days—water containing 0.05 per cent sodium chloride). Left: Conventional grease. Right: Corrosion inhibited grease.**

Summary

Water contamination of grease lubricated chassis parts reduces the effective life of the lubricant and promotes corrosive wear. Water corrosion of wheel bearings also occurs particularly during non-operating periods and may lead to premature fatigue failure of bearing surfaces.

Laboratory evaluation tests which simulate and appear to correlate with field performances have been used to develop automotive greases affording better protection and performance in the presence of water. Results show that greases with "built-in" corrosion inhibiting properties are particularly effective in minimizing the damage normally resulting from water contamination.

Acknowledgement

The author is indebted to J. D. Smith and H. L. Hendricks for the data and most of the photographs used in this paper.

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Authors test a rheopectic grease in an automatic lubricator. From left they are Neesley, Brunstrum and Liehe.

A RHEOPETIC ... for chassis

By J. D. NEESLEY, L. C. BRUNSTRUM

PRESENT PRACTICE in chassis lubrication is a practical compromise but not the only method that might be used. Major factors involved are the limitations of the dispensing pumps, flow properties of the lubricant, and frequency of lubrication. More rugged and costlier pumps could dispense heavier grease that might require fewer grease jobs. Less rugged pumps would require softer grease or oil which, in turn, would require more frequent lubrication because of faster drippage. Any change in one factor requires modification of the other two.

Even with the uniformity of practice we now enjoy, some degree of matching pumps and products is necessary. Pumps, greases, and dispensing conditions vary enough that pump and grease manufacturers have developed a method[1] to establish accepted limitations of a given pump-grease combination.

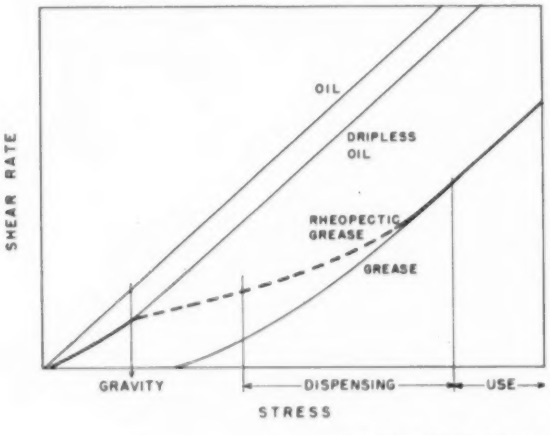
A new central lubricating system[2] also imposes limitations on selection of a lubricant. It functions best with dripless oils or semi-fluid greases, which feed better than regular chassis grease but are not retained as well. Frequent relubrication may be conveniently done enroute. Although this method gives adequate lubrication, it can result in troublesome drippage and excessive consumption of the lubricant.

A lubricant is needed that is both an oil and a grease. A rheopectic material—one that solidifies upon flow—has the required combination of properties.

The flow properties of such a grease are compared in Figure 1 with those of three conventional lubricants—oil, dripless oil, and grease. Oil begins to flow under any small force, and flow increases in proportion to the force

FIGURE 1

FLOW CHARACTERISTICS OF CHASSIS LUBRICANTS



Abstract

New automatic chassis lubricators renew lubricant problems. Oils feed well but drip from the bearings; chassis greases do not drip but feed poorly. A new rheopectic grease overcomes these deficiencies. Originally, it is fluid like an oil, yet upon one pass through the lubricator, it acquires the consistency of a chassis grease. Normal handling has no effect on its fluidity and use has little effect upon its set-up consistency. Thus, it feeds well but does not drip.

GREASE

lubrication

and H. J. LIEHE, Standard Oil Company, Indiana

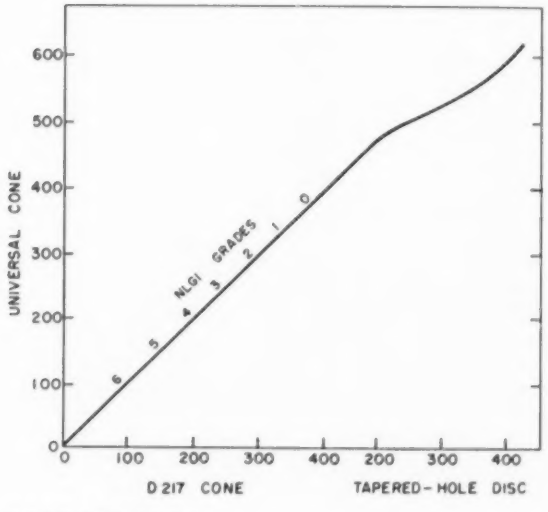
applied. Thus, it feeds readily to a pump inlet but may drip from a bearing under the force of gravity. Dripless oil flows almost as readily and resists drippage only slightly better. Grease requires more force to initiate flow; it does not drip under the influence of gravity but neither does it feed readily into small pump openings. The dispensing force is higher than for oil. At the higher shear rates during use, the three products function much alike. Furthermore, these three curves are reversible; after a machine stops and the stress is reduced, oils continue to drip; greases do not. Rheopectic grease feeds readily under low stress and is irreversibly converted to a grease upon dispensing.

A product of this type was studied in laboratory viscometers and service tested in central systems. It consists of a lithium soap and a mineral oil of 400 SSU viscosity at 100°F. Two products were used for comparison; a dripless oil containing 2 per cent hydrocarbon polymer in an oil of 1500 SSU viscosity and a chassis grease made with 4.5 per cent of calcium soap and an oil of 350 SSU viscosity.

The consistency change of the rheopectic grease during laboratory tests was measured in terms of cone penetration. A universal cone[3] under consideration by Technical Committee G of ASTM, was used because it encompasses the entire range in consistency of the rheopectic grease. The relation of penetration measurements with this cone to those with the regular ASTM D 217 cone and the tapered-hole disc[3] is shown in Figure 2.

FIGURE 2

RELATION OF PENETRATION SCALES



Four Devices Were Used

Both the rate and extent of change from fluid to semi-solid consistency are of practical significance. To study them, four devices giving different shear rates were used. The effect of mixing at low shear rate on the undispensed grease was determined on a laboratory shaker. Consistency change at intermediate shear rates was obtained by working the grease 60 strokes per minute in each of two workers: an ASTM worker and a second worker fitted with a plate having holes 1/16 inch instead of ¼ inch in diameter. To work the grease at an undetermined but high shear rate, a central-lubricating unit, the Multi-Luber, was used.

Final Consistency Depends on Shear Rate

In each device the time required for the grease to reach final consistency depended upon the shear rate:

Shear Rate, Sec.[-1]	*Seconds*
Low (shaker)	
400 (worker, ¼ in. holes)	15,000
4000 (worker, 1/16 in. holes)	1,000
High (Multi-Luber)	1

The rheopectic grease in its original container was agitated on the shaker for 24 hours with no change. As shown in Figure 3, final consistency is attained faster in the worker with the smaller holes because it operates at a higher shear rate. Final consistency was reached with one pass through the Multi-Luber.

Because agitation at low shear rate has no effect on consistency, the rheopectic grease will remain fluid in the lubricator reservoirs and in storage. The high shear rate obtained in the Multi-Luber rapidly converts it to the consistency of an NLGI zero-grade grease.

Performance of the rheopectic grease can be predicted in terms of apparent viscosity.[4] Measurements, according to ASTM method D 1092, are compared in Figure 4 with those of the conventional chassis grease and the dripless oil. The rheopectic grease is initially similar in viscosity to the dripless oil. At low shear rate, where ordinary

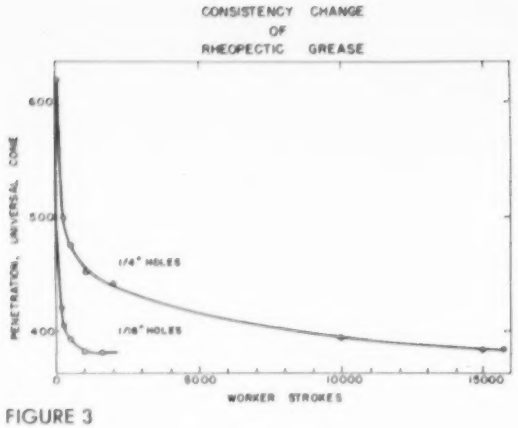


FIGURE 3

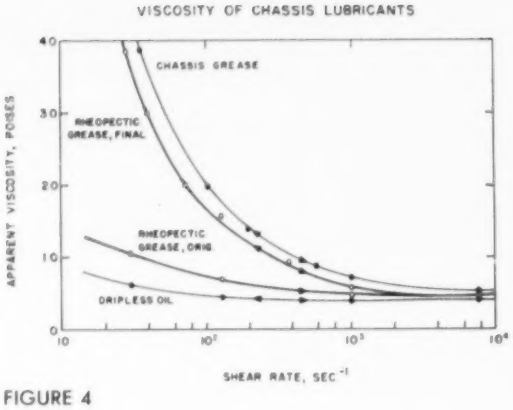


FIGURE 4

greases are semisolid, it shows oil-like flow properties, as indicated by the flatness of the curve. Because the rheopectic grease with final consistency is similar to the chassis grease, comparable service performance is expected.

Service tests of the rheopectic grease were carried out in order to observe product stability and performance. An over-the-road tractor-trailer unit and a passenger car were equipped with Multi-Lubers containing rheopectic grease. Periodic observations were made for 5 months. Throughout this time the grease in the lubricant reservoirs remained unchanged. Even at ambient temperatures as low as -20°F, flow was satisfactory and the lubricators functioned properly. Even at temperatures up to 100°F, no evidence of drippage from chassis under static conditions was observed.

These tests show the practicality of using a rheopectic grease in automatic lubricators.

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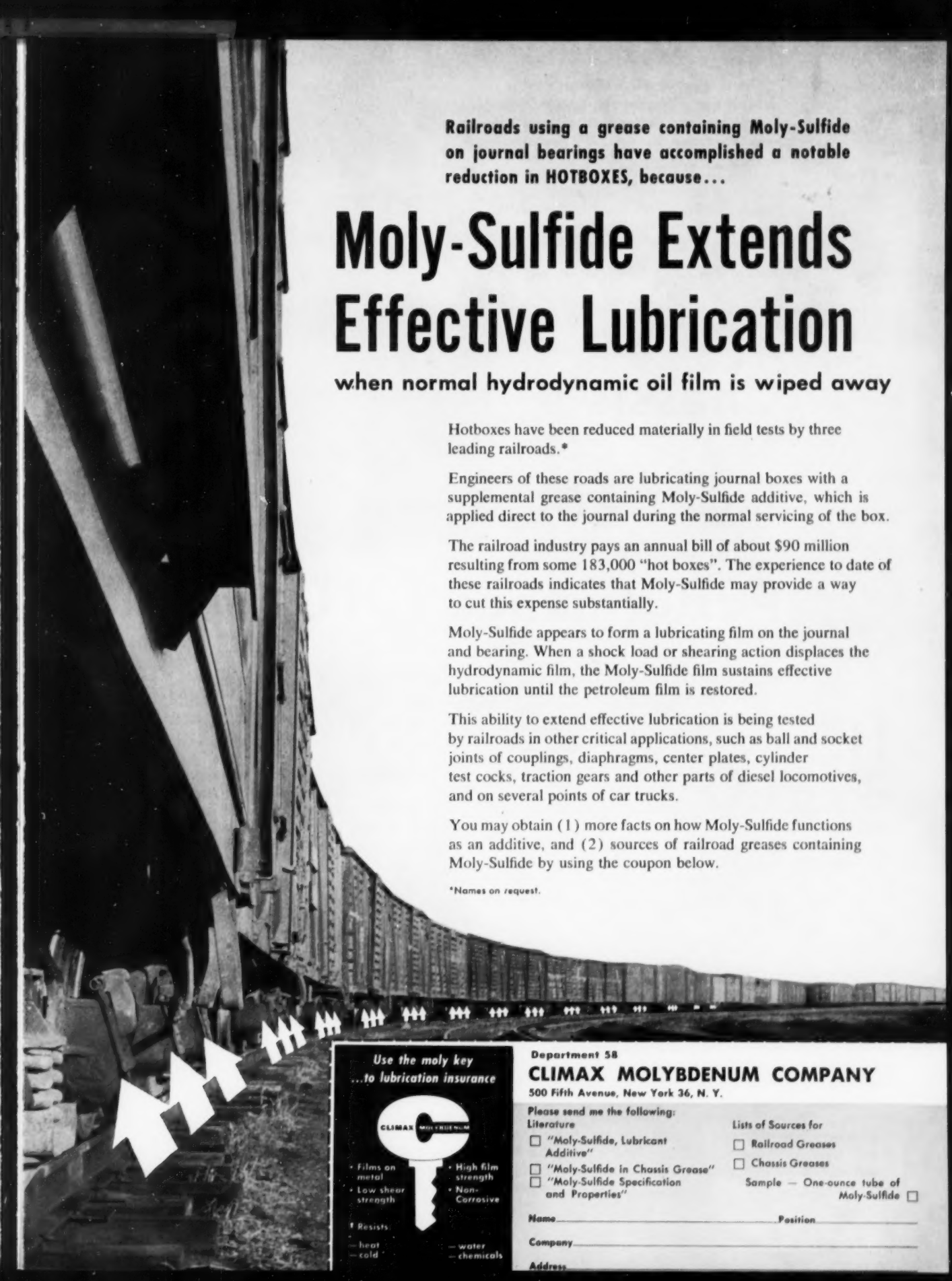

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By J. F. McGrogan
Atlantic Refining Company, Inc.

Chassis Lubricant Performance . . . DRIVER'S

HOW OFTEN have you heard the remark: "My car needs a lubrication?" This is frequently based on the recommendation of the car manufacturer or the petroleum supplier. Sometimes it is based on the car owner's observation or his wife's complaint about squeaks. Those of us concerned with the development of improved chassis lubricants have frequently called upon the public in one way or another to measure the efficiency of our improved products, our objective being greater squeak-free mileage. We have found it difficult, or nearly impossible, to get accurate public opinion on this characteristic. Miscellaneous non-chassis noise, type of driving, and heavy traffic conditions all tend to minimize detection by the driver. Notwithstanding all these interferences, complaints have been recorded. It is this general area of study that received our attention recently to determine driver reaction to car performance as affected by four different petroleum greases.

Abstract

A road test was conducted by the automotitve laboratory of the Atlantic Refining Company on twelve cars, six each of two different makes, to obtain the driver's reactions to four chassis lubricants. Factors to be evaluated included squeaks heard by the driver. An investigation was made of the influence of grease composition on chassis performance; greases tested included an aluminum stearate grease, two lithium soap thickened greases and a non-soap type of grease. Results indicate that a 1,000 *mile lubrication frequency is important since a large increase in complaints beyond* 1,350 *miles of operation was recorded.*

We were most fortunate in our laboratory to include these chassis lubricant studies in the course of a road test conducted by our automotive laboratory. Two makes of cars were included, six cars of each make. Drivers for these cars were research department employees with technical backgrounds and in the supervisory positions. The cars were circulated among all drivers each week and were driven in exactly the same manner and for the same purpose he would use his own automobile. After completing the week's driving schedule he filled out a form which included observations of car and product performance. Among many aspects of the car performance one category included chassis performance with items to be checked either *squeaks* or *no squeaks*. The test lasted over a period of 30,000 miles.

It is interesting to note that there were complaints. On one grease we have used in the service stations for many years, 38 complaints out of 100 lubrications were recorded prior to 1000 miles of operation. This fact alone reveals the part psychology plays in these matters. These

Skelly Oil Company Photo

REACTION

drivers are obligated to fill out these forms as part of their contributions in return for the expense-free use of the cars. This may have sharpened their awareness of squeaks accounting for the large number of complaints recorded. On the other hand, the number of customer complaints in the service stations, involving millions of cars lubricated with this same product, are too few to mention despite the offer of a free lubrication if noise or squeaks occur within 1000 miles following lubrication. Ability of the drivers to rate noises does not seem to be affected by driver's background. Personnel of the Automotive Laboratory registered 4.8 complaints/driver compared to 4.5 complaints/driver for all other groups.

Co-workers McDevitt, left, Rondinell and article author McGrogan inspect test grease.

Some drivers are much more critical than others as shown in Chart I. It is interesting to note that:

> One third of the drivers were responsible for 75 per cent of all complaints under 1000 miles.
>
> One fifth of the drivers were reponsible for 50 per cent of all complaints under 1000 miles.

The occurrence of the first complaint following each lubrication is of interest. Chart II illustrates this pointt. A larger number were recorded up to 250 miles than was experienced in any other 250 mile range up through 1250 miles. This may be due to neglect on the part of the lubricator. By far, the most interesting observation was the large increase in complaints beyond 1250 miles of operation. These data indicate the importance of a 1000 mile lubrication frequency.

An investigation was made of the influence of grease composition on chassis performance. In general, the major factors that may be expected to exert an influence would include:

1. Grease consistency or body.
2. Thickener type and additives.
3. Oil viscosity.

The four greases used in this test may be described as follows:

Grease 1—An aluminum stearate thickened high viscosity high V.I. oil of an N.L.G.I. Number 1 consistency. This grease is water insoluble and has a melting point about 200 F. It has limited shear stability.

Grease 2—A Number 2 consistency lithium soap thickened grease made with a medium grade high viscosity index oil. This lubricant is water insoluble, has a dropping point above 350 F., is completely shear stable, and contains oxidation and rust inhibitors as well as extreme pressure agents.

Grease 3—This lubricant is identical to grease 2 except that it is less shear stable.

INFLUENCE OF DRIVER ON COMPLAINTS

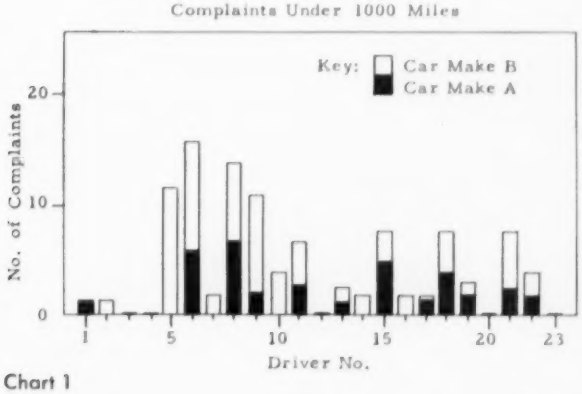


Chart 1

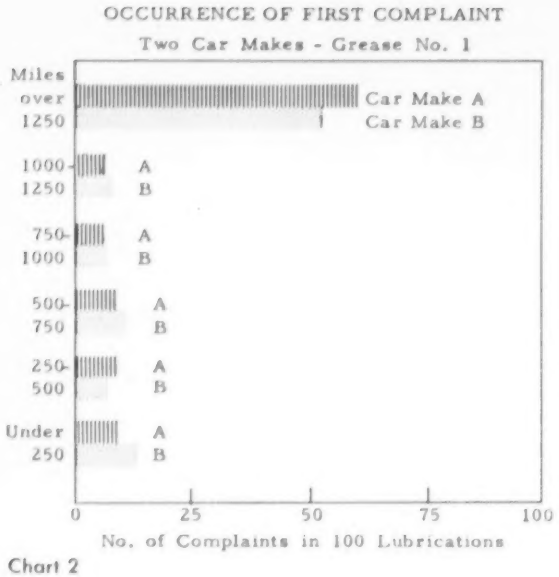


Chart 2

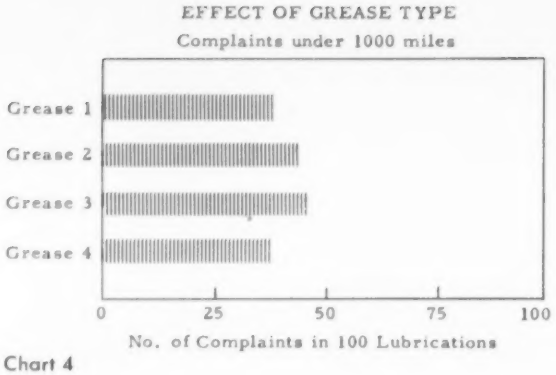


Chart 4

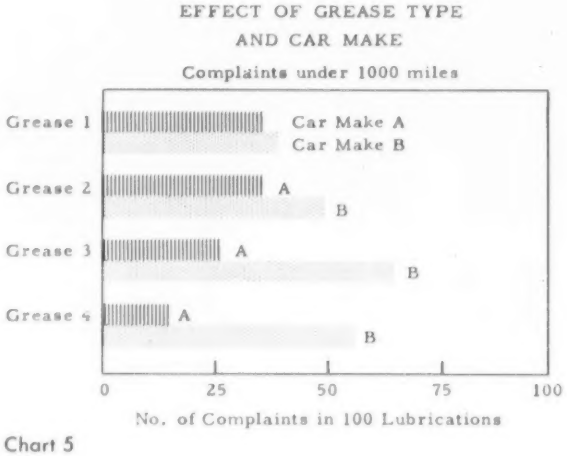


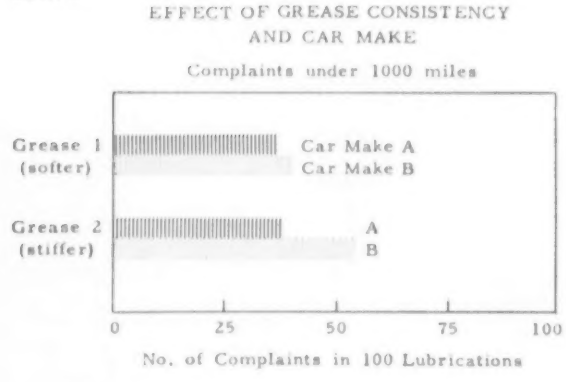
Chart 5

Grease 4—A non-soap type grease; water insoluble, N.L.G.I. consistency Number 2 with a melting point above 500 F. Contains an oil the same as grease 2 and 3 plus oxidation inhibitor. It also has limited shear stability.

Chart III presents the effect of grease consistency on observation of chassis performance. It will be noted that the softer grease performs to about the same level in both type cars. However, increasing the body or stiffness gives rather unexpected results. Cars A had about the same performance while cars B became markedly poorer.

The influence of the grease type on complaints under 1000 miles of operation on all cars indicates very little effect by widely different lubricants. This is shown by Chart IV. If we separate the data according to car make, the problem is further complicated by the chassis design. Cars A progressively improve using the greases in numerical order but cars B squeak more often with each of these lubricants. Chart V illustrates this point.

Chart 3



Certainly design, material and manufacture of the chassis influence the performance of the petroleum products used. Chassis noise or squeaks at 500 miles and 1000 miles represent very low actual hours of operation. Perhaps only 20 to 50 hours are involved. One must realize that these same lubricants that permit squeaks in these times have lubricated anti-friction bearings for 30,000 to 40,000 hours without any sign of distress at temperatures and speeds much higher and more severe than experienced in a chassis. This comparison serves to indicate the product quality that is now available in lubricating greases. Additional properties might be added if we knew in what direction to go.

Perhaps more specific cooperative studies by the automotive and petroleum companies on this subject would be worthwhile. Perhaps advantage could be taken of the existing grease properties starting at the drawing board. Better sealing, ease of accessibility of fittings, perhaps greater grease reservoir at the fitting might help. A design analysis of cars A and B might be revealing and point toward design modifications to take advantage of modern lubricating greases.

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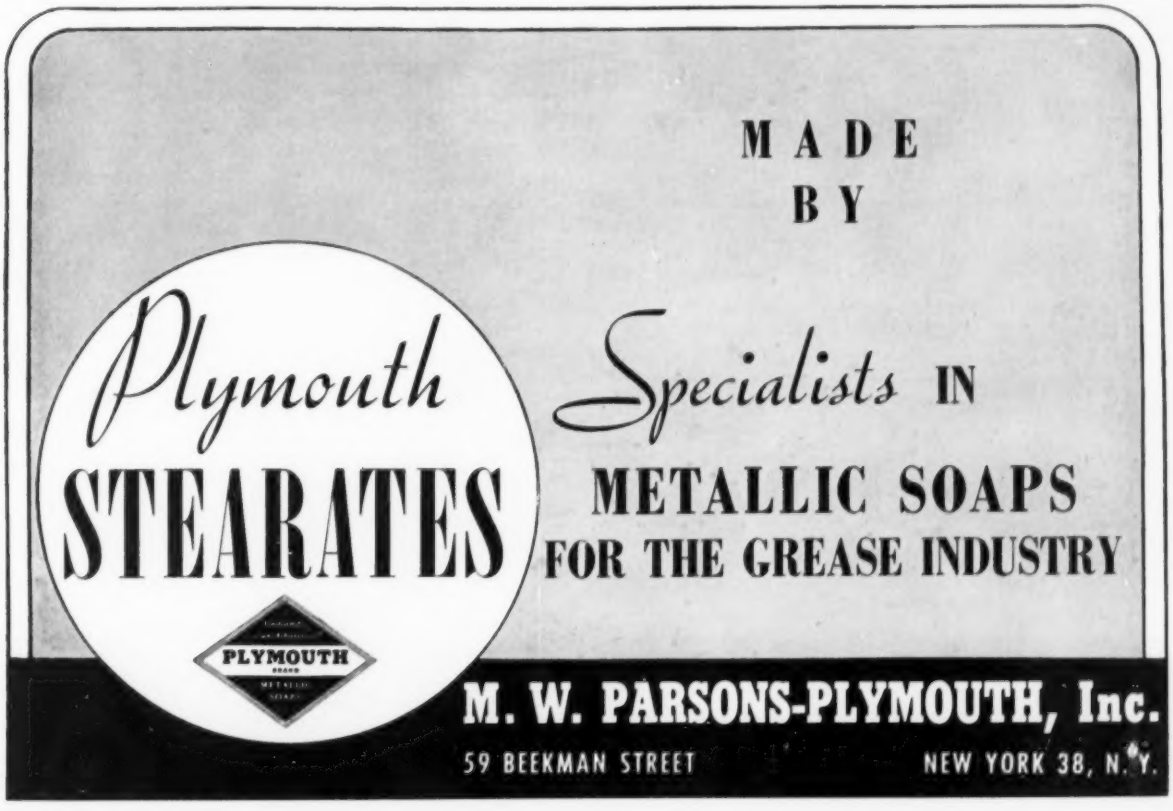

Patents and Developments

Water-Resistant Non-Soap Grease Containing Alkaline Agents

Greases broadly comprise two principal classes, namely, those gelled with soaps of high molecular weight carboxylic acids and a newer class wherein the gelling agent comprises inorganic colloidal materials or onium clays. Useful amorphous colloids comprise such substances as silica or alumina and typical onium clays are those having a high base-exchange capacity which have been reacted with a quaternary onium compound to form a hydrophobic onium clay complex. Another type of material useful for grease formation comprises the combination of a high base-exchange clay waterproofed by adsorption of hydrophobic soaps or other hydrophobic surface-active agents.

In the absence of hydrophobic surface-active agents either the amorphous gelling agents or gelling agents prepared from clays exhibit water-sensitivity which reduces the practical applications of greases made therefrom. In overcoming this shortcoming, greases have been prepared containing not only a lubricating oil and an inorganic gelling agent but also a cationic, ionic, or non-ionic surfactant providing the composition with water-resistant properties. While the presence of the hydrophobic surface-active agent appears to be essential for successful utilization of the grease, this third component constitutes the most expensive ingredient therein. The gelling agent and the lubricating oil are relatively inexpensive materials, but the surfactants must usually be present in amounts of at least about 30 per cent by weight of the gelling agent and, hence, constitute a major cost item in the grease.

In accordance with U.S. Patent 2,748,081 issued to Shell Development Company, it has been found that greases gelled with inorganic colloids and containing a hydrophobic surfactant may be modified by the presence of between about 0.1 per cent and 1.0 per cent by weight of the grease of alkali metal salts and hydroxides exhibiting an alkaline reaction when in contact with water. The presence of the alkali metal salt has been found to materially reduce the proportion of hydrophobic surface-active agent which is required to provide the grease composition with suitable water-resistant properties. Preferably, the proportion and identity of the salt is such as to provide the grease with sufficient potential alkalinity that when in contact with water the pH therefore is above about 9.5.

The alkali metal salts and hydroxides which may be employed for this purpose may be those of sodium, potassium or lithium including hydroxides, carbonates, bicarbonates, acid phosphates and borates. Typical species coming within these classifications are as follows:

Hydroxides: Sodium hydroxide, potassium hydroxide, lithium hydroxide.

Carbonates: Sodium carbonate, potassium carbonate, lithium carbonate.

Bicarbonates: Sodium bicarbonate, potassium bicarbonate, lithium bicarbonate.

Hydrogen phosphates: Sodium dihydrogen phosphate, disodium hydrogen phosphate, potassium dihydrogen phosphate, dipotassium hydrogen phosphate, lithium dihydrogen phosphate, dilithium hydrogen phosphate.

Borates: Sodium borate, potassium borate, lithium borate.

The phenomena upon which the patented process depends have not been clearly elucidated. However, it has been determined by means of comparative testing that the presence of the subject alkali metals salts or hydroxides, within the limits specified, produces greases which exhibit superior lubricating characteristics with respect to bearing temperature, wear, corrosion and even noise. Also, the addition of these materials drastically reduces the requirement for hydrophobing agent for the maintenance of grease structure in the presence of water. The latter property is especially unaccountable, since it has been postulated previously that the hydrophobic character of the subject gelling agents is directly dependent upon the percentage of the gel surface which is coated with at least a monomolecular layer of the hydrophobic surface active agent.

When greases comprising a gelling agent such as silica, mineral lubricating oil and a waterproofing agent are utilized for the lubrication of a ball bearing assembly, it has been found in many cases that undue wear occurs and that the bearing tends to heat up while in operation. The addition of an alkali metal hydroxide or salt (such as sodium bicarbonate) substantially reduces the temperature of the bearing during operation.

When the subject additives are not present, satisfactory resistance of the grease to the disintegrating influences of water is achieved only by the presence of an excessivly large amount of waterproofing material, such as an amine or amino-amide. It has been noted that, as the proportion of waterproofing agent to gelling agent becomes larger, a softening effect of the grease becomes more pronounced. Often it is necessary to use such a high proportion of waterproofing agent that the gelling agent content must be increased to counteract this softening action.

One of the unexpected results of adding these alkali metal alkaline agents to this class of greases is the substantial reduction in the requirements for high ratios of waterproofer to gelling agent. In certain instances it has been found that only half as much waterproofing agent was required, when a salt such as disodium acid phosphate was present, in order to maintain satisfactory water resistance. This not only eliminated softening of the grease but also reduced wear and improved other lubricating characteristics.

As noted before, the waterproofing agents are by far the most costly ingredients used in the subject compositions. The material reduction in the requisite amount, caused by the addition of an alkali metal alkaline agent, is one of distinct economic importance and constitutes a

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major advantage of the patent. The following directions are given for producing the compositions:

Grease-Forming Gels

The greases should contain from about 1 per cent to about 20 per cent of a grease-forming gel, based on weight of the total composition. These gels are in a highly porous form, having their normal water content replaced with a lubricating oil. As intimated hereinbefore, grease-forming gels are divided into two main classes. These include the amorphous substances and the crystalline materials capable of gel formation. Amorphous gels especially suited for use in this patent include especially the inorganic oxides, hydroxides, sulfides, sulfates, carbonates and phosphates. The most typical members having wide utility are silica; amphoteric metal oxides such as alumina, alkaline earth metal oxides and hydroxides including magnesia and lime; copper sulfide; calcium sulfate and manganese phosphate. These may be employed either as the single material or, more preferably, as mixtures thereof so as to obtain optimum combinations of properties peculiar to each species. For example, it has been found that greases gelled with silica are less effective for preventing corrosion than greases gelled with mixtures of magnesia and silica. In place of magnesia, silica may be mixed or co-precipitated with other polyvalent metal oxides capable of colloidal dispersion such as alumina and lime. Preferably, the amount of polyvalent metal oxide in admixture with silica is present in an amount greater than about 3 per cent but less than about 40 per cent based on the total weight of the inorganic microgel.

The second category of grease-forming materials contemplated for use in the compositions of this patent are those which in themselves are not usually capable of grease formation due to their low surface area and crystalline structure but which may be modified so as to provide them with suitable grease-forming properties. This class includes especially natural and synthetic clay-like substances which are modified by reaction with a cationic hydrophobic agent or by having a hydrophobic surface-active agent adsorbed on the swollen clay.

The clays which are useful as starting materials are those exhibiting substantial base-exchange properties and particularly those exhibiting comparatively high base-exchange properties and containing cations capable of relatively fast replacement. These clays (particularly contemplated by the specification and the claims) include the montmorillonites such as sodium, potassium, lithium and other bentonite, including Wyoming bentonite, magnesium bentonites, Hectorite and saponite: Attapulgite; zeolites and fuller's earths, particularly those of the Georgia-Florida type. These clays are characterized by an unbalanced atomic structure or unbalanced crystal lattice and are believed to have negative charges which are normally neutralized by inorganic cations. As found in nature, therefore, they exist as salts of the weak clay acid with bases such as the alkali or alkaline earth metal hydroxides.

The base-exchange capacities of the various clays enumerated run from about 15 to about 100 milliequivalents of exchangeable base per 100 grams of clay. The montmorillonites have comparatively high base-exchange capacity, usually between 60 and 100. Generally, the clays of higher base-exchange capacity (above about 25) are particularly useful where high exchange or adsorption of an organic base is desired.

As stated before, these clays may be converted to grease-forming materials by ion-exchange with a hydrophobic cationic surface-active material or by the adsorption of hydrophobic surface-active agents. If ion-exchange is desired, it is preferable to disperse the clay in water and thereafter treat it with a quaternary ammonium salt bearing at least one hydrophobic hydrocarbon radical having at least 10 carbon atoms in a substantially straight aliphatic chain. In addition to using quaternary ammonium compounds, salts of amines may be utilized for the preparation of onium clays. Further, the analogs and homologs of said amines and quaternary ammonium compounds may be used of which the following are typical: triphenyl alkyl phosphonium, arsonium, stibonium halides; dialkyl or allyl sulfonium and silane onium halides, and pyrones such as 2,5-dialkylgammapyrone isochloride. The cationic surface-active materials useful for ion-exchange with or adsorption on the gelling agents of the present greases will be discussed in greater detail in the following section. Preferably the grease forming gels have bulk densities between about 0.025 and about 0.5 g. per cc. and particle size between about 0.1 to about 5 microns.

Lubricating Oil Bases

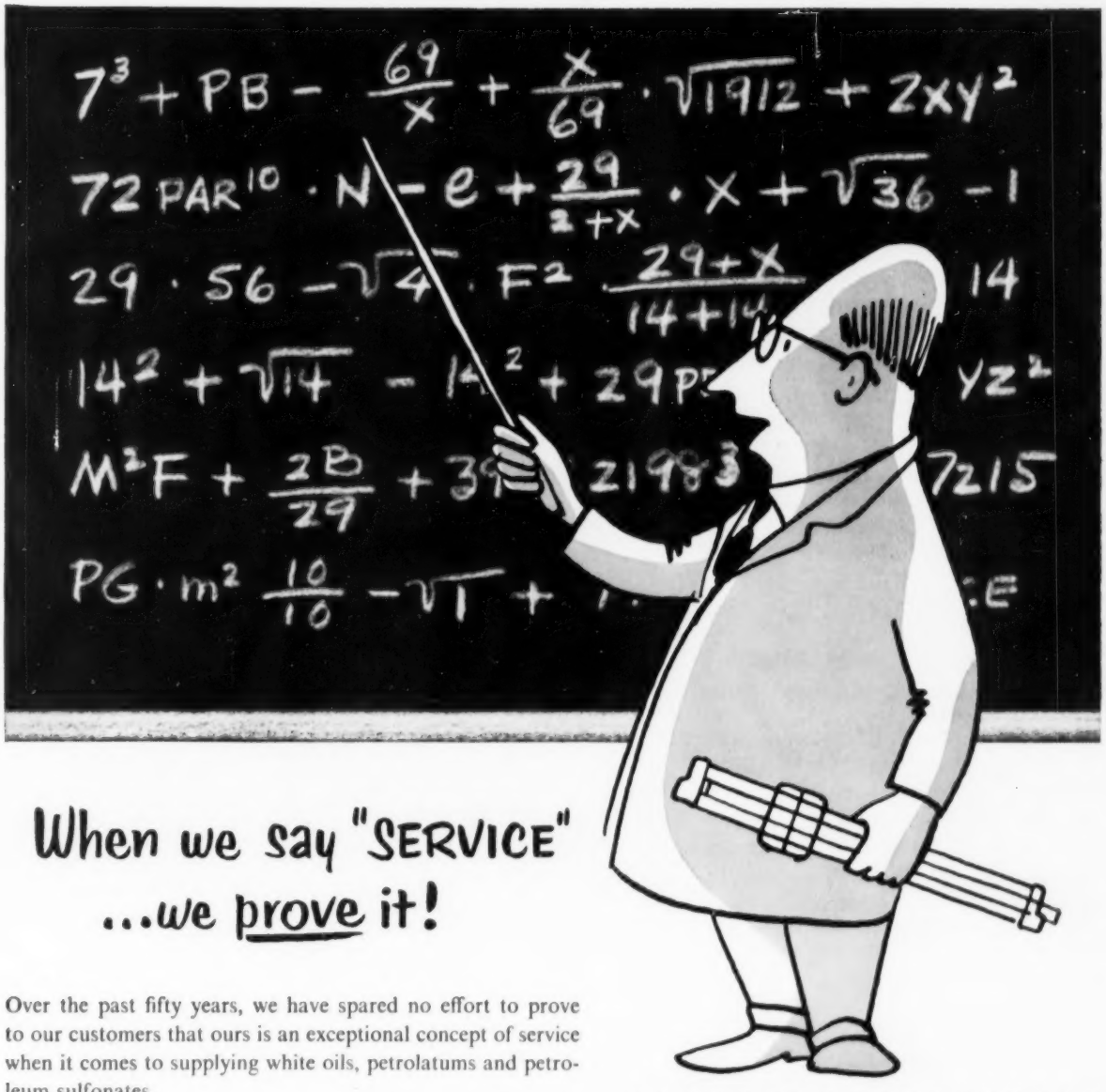
The oleaginous fluid vehicles useful in the formation of the greases of this invention include both natural and synthetic lubricants.

The base lubricant for forming greases by the process may be selected from a wide variety of natural and synthetic oils. Mineral oils of wide viscosity range varying from about 50 to 2,000 SUS at 100°F. and having a viscosity index of from below zero to about 80 can be used as well as their mixtures. A preferred mineral oil base may be prepared by redistilling a lubricating oil over caustic soda, extracting the distillate with furfural, nitrobenzene, phenol, etc., and refining the raffinate with a suitable adsorbent material to give an oil having the following properties:

Specific gravity at 60° F.	0.861
Flash point, °F.	275
Pour point, °F.	-70
Final B.P., °C. (ASTM)	370

Mixtures of mineral oil and fixed oils such as castor oil, lard oil, and the like, can be used as well as organic synthetic lubricants and mixtures thereof such as:

I. Synthetic lubricants produced by the Fischer-Tropsch, Synthol, Synthine and related processes, e.g.:
   - A. Polymerization of olefins such as ethylene, butylene, and the like, and their mixtures in presence of a Friedel-Crafts or other type condensation catalyst under elevated temperatures and pressures.
   - B. Polymerization of unsaturated hydrocarbons in presence of a catalyst and then condensing said polymerized product with an aromatic hydrocarbon such as xylol, benzol, naphthalene, etc.



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☐ "General Information on Petroleum Sulfonates" I.R. Bulletin "G"

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C. Oxidation of polymerized olefins of lubricating range as noted under A and B.

D. Process of converting natural gas to carbon monoxide and hydrogen, followed by catalytic reaction under elevated temperature and pressure to produce hydrocarbons and lubricating range (Synthol process).

II. Synthetic lubricating products produced by the Bergius process, e.g., by:

A. Hydrogenation of coal, peat and related carbonaceous materials under pressure and elevated temperature in presence of a catalyst.

B. Hydrogenation of asphalts, petroleum residues and the like.

III. Synthetic lubricants produced by the voltolization process, e.g., by:

A. Voltolization of fatty materials such as fatty oils.

B. Voltolization of mixtures of fatty oils and petroleum hydrocarbons.

C. Voltolization of unsaturated hydrocarbons, their mixtures, and the like.

IV. Organic synthetic lubricants:

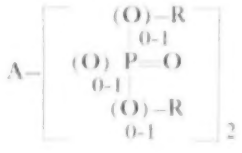
A. Alkyl esters of organic acids, e.g.:
Alkyl lactates
Alkyl oxalates
Alkyl sebacates (2-ethylhexyl sebacate)
Alkyl adipates
Alkyl phthalates (dioctyl phthalates)
Alkyl ricinoleates (ethyl ricinoleate)
Alkyl benzoates

B. Alkyl, alkylarly esters of inorganic acids, e.g., such as the phosphorus esters.

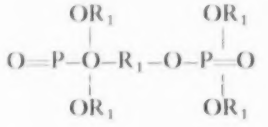
This particularly desirable class of oleaginous bases for the present compositions comprises organic phosphorus esters including phosphates, phosphonates, phosphinates, as well as the corresponding oxides. Typical species include:

Tricresyl phosphate
Trioctyl phosphate
Tributyl phosphate
Bis (3,5,5–trimethylhexyl)–2,4,4–trimethylpentene phosphonate
Tris (3,5,5–trimethylhexyl) phosphate
N–heptenyl bis (3–butylpentane) phosphinate
Bis (3,5,5-trimethylhexane) octane phosphine oxide

Another highly desirable type of phosphorus lubricants includes the diphosphorus compounds including the four classes referred to above. Preferably, the diphosphorus compounds have a configuration as follows:



wherein A is an organic radical preferably aliphatic or aromatic hydrocarbon radical or alternatively an oxahydrocarbon radical or the corresponding sulfur, selenium or tellurium-containing hydrocarbon radicals preferably saturated aliphatic hydrocarbon radicals having from 4 to 12 carbon atoms. The above configuration contemplates diphosphates, diphosphonates, diphosphinates and diphosphine oxides. A particularly desirable configuration comprises those diphosphates having the following configuration:



wherein each R_1 is an aliphatic hydrocarbon radial having from 2 to 6 carbon atoms. It has been found that lubricants of this particular configuration possess unexpectedly extreme low temperature operating characteristics. Species of such lubricants include:

1,4-butanediol bis (dibutyl phosphate)
1,3-propanediol bis (diamyl phosphate)

V. Synthetic lubricants made by polymerization of alkylene oxides and glycols at elevated temperatures in the presence of catalysts such as iodine, hydriodic acid, etc:

A. Polymers of alkylene glycol:
Trimethylene glycol
Propylene glycol
Tetramethylene glycol
Hexamethylene glycol
Pentamethylene glycol

B. Copolymers of:
Trimethylene glycol and triethylene glycol
Trimethylene glycol and hexamethylene glycol
Trimethylene glycol and beta-methyltrimethylene glycol
Trimethylene glycol and diethylene glycol

C. Copolymers prepared from certain epoxides at elevated temperatures and in presence of KOH of BF_3-ether catalyst, e.g.:
Ethylene oxide and propylene oxide
Isobutylene oxide and propylene oxide
Epichlorohydrin and propylene oxide

D. Sulfur containing polymers obtained by treating allyl alcohol, divinyl ether, diallyl ether, diallyl sulfide, dimethallyl ether, glycols, with H_2S in presence of a catalyst such as toluene sulfonic acid, peroxides, ultraviolet light, e.g.:
Dihydroxy diethyl sulfide
Dihydroxy dipropyl sulfide
Trimethylene glycol and dihydroxy dipropyl sulfide
Trimethylene glycol and dihydroxy diethyl sulfide

VI. Polymers obtained from oxygen-containing heterocyclic compounds, e.g., polymerization of tetrahydrofuran in the presence of a catalyst.

VII. Silicon polymers, e.g.:
Polyalkyl siloxane and silicate polymers
Alkylarlyl siloxane and silicate polymers

Grease Chemists:

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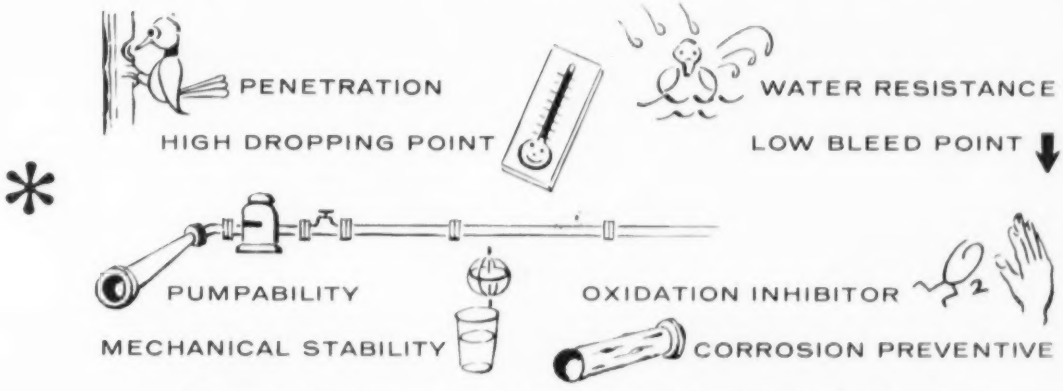

* The action of lithium as a gelling agent dominantly controls the first four of these functional properties. Fatty acids, oil and auxiliary additives influence the last four. Lithium does not adversely affect any of these critical properties.

There are definite manufacturing and marketing advantages in producing lithium-based grease. Inventory control is but one of them. Being a true multipurpose product, only one lithium soap grease is needed to lubricate your car: chassis, water pump, wheel bearings and universal joints. Often, several single-purpose lubricants are replaced in special industrial applications. Of equal significance is Lithium Corporation's acceptance in the field: over 10 years' production experience supplying lithium hydroxide to the grease industry. Add to this our unsurpassed production facilities and you are assured of a reliable source of consistently uniform quality LiOH, available from inventory for immediate shipment. Since we are equally interested in developing better lithium products, why not get in touch with us? A card or letter will bring immediate response.

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Dimethyl siloxane and silicate polymers, etc.

VIII. Halogenated aromatics may be used, especially when high temperatures operations are required. These include chlorinated phenyls such as mono- and dichlorodiphenyl, trichlorodiphenyl, chlorinated terphenyls and higher molecular weight analogs thereof.

Hydrophobing Agents

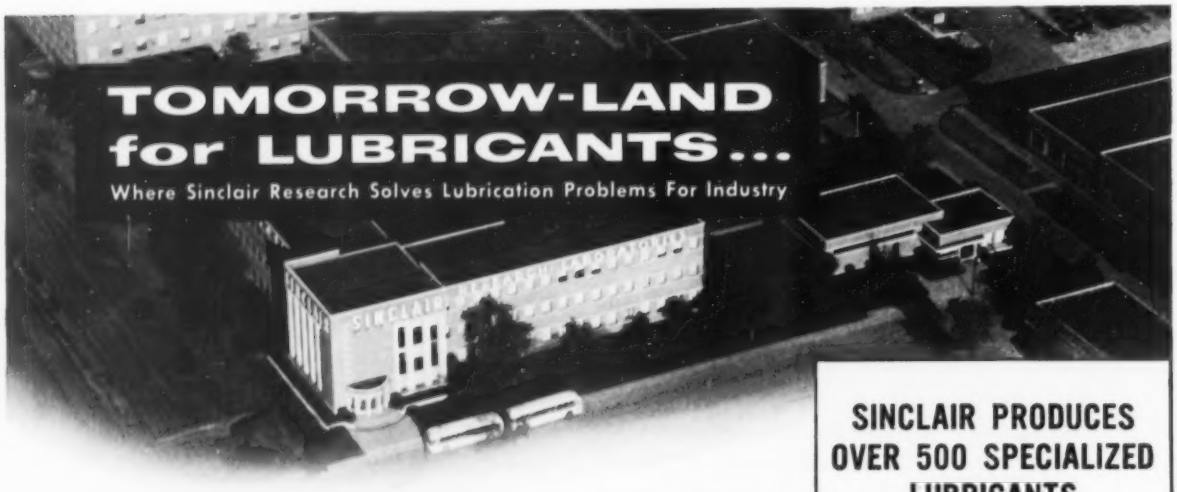
The gelling agents should be waterproofed by the presence of a non-acidic hydrophobing substance, and preferably between 35 and 65 per cent by weight.

The materials useful for the primary object of providing water resistance to the subject greases are those bearing hydrophobic radicals and preferably include amines and ammonium compounds as well as isologs of the ammonium group including phosphonium, arsonium, stibonium, oxonium and sulfonium compounds. More particularly, the preferred class of agents for providing optimum water resistance of these greases includes aliphatic amines and, still more preferably, aliphatic hydroxy amines containing at least 3 hydroxyl and amino groups, as long as they are hydrophobic derivatives. The amines may be simple aliphatic hydrocarbon amines such as octadecylamine or other amines having from 8 to 36 carbon atoms. Typical of these are dodecylamine and hexadecylamine.

While these substances are hydrophobic without modification, even better results have been obtained by utilizing amines bearing a plurality of nitrogen atoms and, hence, a higher proportion of nitrogen to carbon content. Preferably, these polyamines contain at least one hydroxyl substituent and are converted to hydrophobic substances by partial amide formation with a hydrophobic anionic substance.

More specifically, the substances include particularly the partial amides of polyhydroxyalkylene polyamines of which the partial amide of the condensation product of epichlorohydrin and ammonia is typical. The following is a representative preparation: Epichlorohydrin is added dropwise, or at least in small incremental proportions, to concentrated aqueous or alcoholic ammonia at a temperature between about 20° C. and 60° C.

The time of addition and the subsequent period of heating may be from about 10 minutes to about 4 hours or more. It has been found that a period of 20-40 minutes for the incorporation of the ingredients followed by ½-4 hours of heating usually results in substantially complete reaction. The reaction components after admixture are heated to a temperature between about 100 and about 170°C. until the reaction product has been dehydrated and condensed to the desired extent. The condensation product thus obtained is a somewhat water-soluble crystaline material which changes to a tacky fluid mass when heated above about 130-150°C. It is soluble to some extent in oil, indicating at least a partial oleophilic character. This substance is believed to be a mixture of monomer, dimer, trimer and polymers wherein the dimer is believed to have the configuration:



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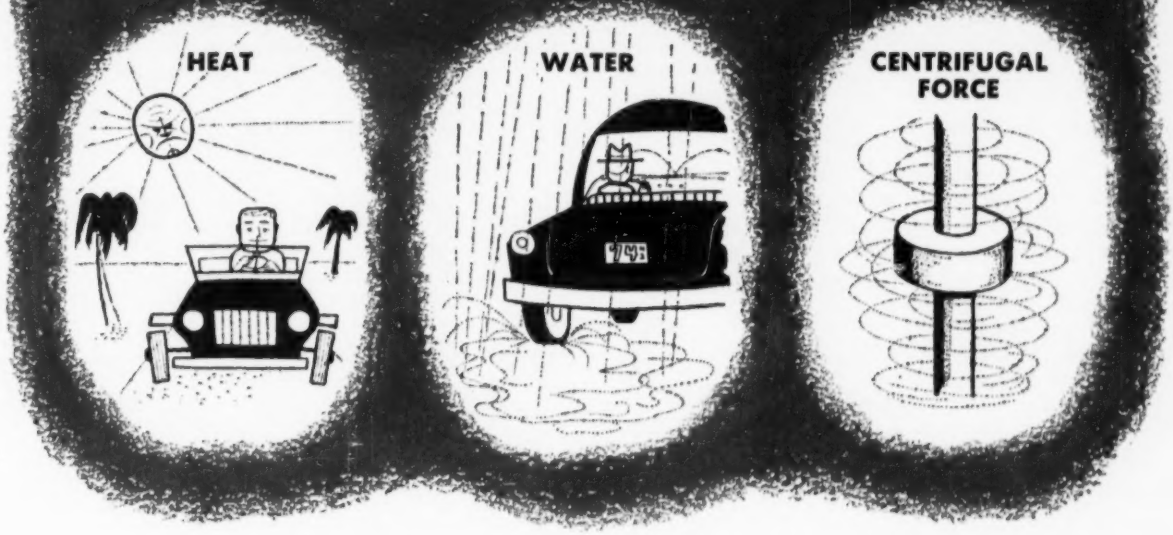

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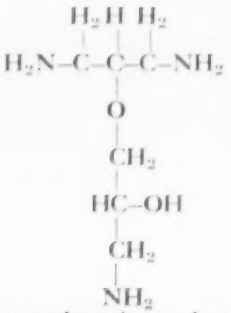

Subsequent to the condensation as described, the product is converted to a hydrophobic surface-active agent by conversion to an amide, such as by heating with tall oil or other hydrophobic anionic material at a temperature from about 150 to about 225°C. for a period from about 15 minutes to about 2 hours. For optimum characteristics in all respects, it is preferred that between about ⅓ and ⅔ of the amino groups present in the condensation mixture be converted to the amide form. It has been found that these partial amides (especially having the defined ratios of amide and amino groups) exhibit optimum hydrophobic and surface-active characteristics.

In place of epichlorohydrin, it is evident that other reactants may be employed such as the general class of monohaloepoxyalkanes, monohalodihydroxyalkanes, and dihalohydrins. Typical species are 2,3-epoxy-4-chlorobutene, 2-chloro-1,3-dihydroxypropane, 1,2-dichloro-3-hydroxypropane, 1,2-dichloro-3-propanol, 1,3-dichloro-2-propanol, 2-chloro-1, 3-dipropanol and 1-chloro-2,3-dipropanol. The corresponding partial amides of polyalkylene polyamines are also effective waterproofing agents. For example the half-amide of oleic acid and ethyl-enediamine is suitable. Further amides of this type which are suitable include the partial amides of ethylenediamine, propylenediamine, diethylene triamine and triethylene tetramine which such acids as tall oil, rosin, oleic acid and naphthenic acid.

Quaternary compounds which are suitable either for reaction with or addition to the gel-forming materials include triphenyl lauryl phosphonium bromide, didodecyl ethyl sulfonium bromide, decyl triphenyl arsonium chloride, decyl triphenyl stibonium iodide, dodecyl ammonium acetate, dimethyl dicetyl ammonium bromide and their homologs and analogs.

While free amines may be utilized as the source of hydrophobic cations, this is not essential since other sources are available and at times are preferred. Thus, salts and amides thereof may also be used. Especially preferred among this class are the salts of the above enumerated amines with high molecular weight acids. Typical among these are the amine salts of the epichlorohydrin ammonia condensation product with oleic acid. Other suitable salts include the salts of diamyl amine and stearic acid, dibutyl amine and tall oil acids, as well as other salts of amines or polyamines, hydroxy amines or hydroxy polyamines with fatty acids, sulfonic acids, dicarboxylic acids

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or phosphonic acids, each of which is capable of yielding a hydrophobic anion when in contact with water.

Typical soaps which are suitable for use in the present compositions include especially polyvalent metal soaps of fatty acids and, more particularly, amphoteric metal soaps thereof. These include primarily lead stearate, aluminum oleate and the corresponding soaps of copper, cobalt, calcium and barium.

Grease Compositions

The greases of the patent may be prepared by several alternative means mainly dependent upon whether the hydrophobing agent is adsorbed on or reacted with the microgel. In the case of the amorphous gelling agents, it is normal practice to prepare greases wherein the hydrophobic surface-active agent is adsorbed on the gel surface. Clay greases may be prepared in a similar fashion. Under these circumstances, the preferred initial step comprises forming a hydrogel of the inorganic material. The hydrogel is washed to remove soluble salts such as sodium chloride, after which the hydrogel is treated with the surface-active agent mixed with lubricating oil preferably containing the anionic surface-active material. The ingredients are subjected to a milling procedure to form a highly dispersed system of the hydrogel in the oil phase. This mixture is then subjected to dehydration and subsequently is finished by further milling or other colloiding procedure so as to produce a suitable grease structure.

The steps involved in the preparation of greases gelled with onium-clays are substantially the same except as follows: the clay is dispersed in water and treated with a hydrophobing amount of a quaternary compound such as dimethyl dicetyl ammonium bromide. From this point on the procedure is substantially identical with that already described.

Another means for the preparation of the present greases comprises the introduction of a drying step subsequent to gel formation but prior to introduction of oil. Utilizing this procedure in the case of the amorphous gels, two alternative steps may be taken. In the first place, the gel may be dehydrated by displacement of water with a volatile liquid such as acetone or methyl alcohol. This in turn may be displaced by addition of oil and subsequent distillation to remove the organic solvent. Alternatively, the solvent-wet gel may be converted to the aerogel form by heating the solvent-wet gel in an autoclave under pressure to a temperature above the critical temperature of the solvent present. Above this point, the solvent is flashed off leaving the amorphous gel in a highly expanded form suitable for grease formation.

Still further means for the preparation of greases comprising the ingredients described before depends upon spray drying of hydrogels of the inorganic gelling agent in the presence of at least a substantial fraction (or all) of the hydrophobic surfactant. Preferably, this spray drying is conducted after homogenizing the hydrogel and surfactant to provide a uniform dispersion often resembling a cream of soft salve. Upon spray drying such material at elevated temperatures in the order of from 80°C.

to 500°C., it has been found that the ultimate particle diameter is sufficiently fine and the bulk density sufficiently low so that the product may be employed for grease formation simply by stirring into a lubricating oil and milling the mixture. It will be recognized that the latter process is especially desirable since it may be conducted in standard plant equipment previously utilized for ordinary soap grease formation. The water-soluble alkali metal alkaline derivatives may be added at any point during these grease preparation procedures but it is preferred that addition be made after the last point at which water is separated from any of the grease ingredients or mixtures.

As pointed out, one of the principal advantages obtained by the use of these alkaline metal compounds comprises the substantial reduction experienced in the requirement for hydrophobic surface-active agent. This reduction may be made without adversely affecting the water-resistant character of the greases.

Synthetic Casein Fiber Grease

Fiber greases are widely used for packing certain types of journal bearings, for example, in railroad rolling stock. A relatively large quantity of such greases is consumed by industry. Such greases usually consist primarily of fibrous material such as wool fiber or yarn impregnated or saturated with an oil or grease composition. This lubricant is packed in a housing in such a way that it presses against the journal as it revolves and keeps it coated with a film of lubricant. The fiber or yarn acts as a reservoir for the oil or grease and prevents rapid consumption of the lubricant while assuring continuous lubrication.

In the prior art when the fibrous material, usually a reclaimed wool or yarn, has been used alone in combination with the lubricant it has tended to become matted and soggy and eventually to pull away from the bearing. This is particularly true when the bearings become heated up to temperatures of the order of 200° F. The oil rapidly evaporates and the fibers lose their resistance even if they are not actually charred. Upon failure of contact of the packing with the bearing there is a failure of lubrication with resulting damage to the bearing.

It has been proposed previously to maintain higher elasticity at ordinary temperatures in the conventional reclaimed wool fiber lubricant packing by inserting a coarser fiber such as horse hair, goat hair or other animal hair. The coarser and stiffer hair and the finer wool fibers are stranded and interspersed with each other and the entire fibrous mass is thereafter saturated with the oil or grease. While horse hair, in particular, has some utility in this connection at ordinary temperatures it is not particularly satisfactory as temperatures go above 150°F. or so and it is not always available. Horse hair and other animal hair fibers are also susceptible to actual damage at elevated temperatures and start to decompose and become brittle at temperatures as low as 150° to 180°F. They are therefore quite unsuitable at the moderately high journal and bearing temperatures frequently encountered in service, e.g., up to about 200°F. or sometimes a little higher.

According to U. S. Patent 2,734,862 issued to Esso Research and Engineering Company, a preferred synthetic fiber for this purpose consists of an extruded casein monofilament sold under the trade name of "Caslan" which can be readily stranded with reclaimed wool, wool yarn or other fibers. About 25% of this synthetic is preferably intermixed with 75% of wool, such as shredded carpet waste.

Aluminum Soap of Iso-Octoic Acids

The production of an aluminum soap of mixed iso-octoic acids is disclosed in patent No. 2,741,629 issued to Leonard Cohen of Baltimore, Maryland. These acids are made by oxidation of iso-octyl alcohols produced from mixed heptenes by an oxo process reaction (which has been described in U.S. Patent 2,553,364). The acids are largely 5, 6 and 7 carbon atoms in length with resulting 3, 2 and 1 methyl group substituents on the carbon chain, the 6-7 carbon chains predominating.

The aluminum di-acid soap is produced by reacting an aqueous sodium soap solution of the acid containing approximately 50 per cent excess caustic, with an aqueous solution of an inorganic aluminum salt such as aluminum sulfate. The resulting insoluble hydroxy aluminum soap is filtered and washed free of by-product salts and dried.

The dried granular soap when added to liquid hydrocarbons creates visco-elastic gels, the consistencies of which will vary with the concentration of thickening agent employed.

MARKETING

ARTICLES NOW ACCEPTED

Certain articles on or about the marketing of lubricating grease will be accepted for publication in the NLGI Spokesman in the future, it was decided at the board of director's meeting in New York City last month.

Marketing committee chairman D. P. Clark remarked that the inclusion of features about selling and distribution would definitely be in addition to the regular technical articles for which the NLGI Spokesman has gained a wide reputation, and that the number of technical articles presented would in no way be cut. Clark and NLGI Spokesman committee chairman H. A. Mayor, Jr. both noted that the magazine has grown and that the increased advertising makes it possible to cover other phases of the industry and render this service.

(A recent survey proved that marketing material was desired by an overwhelming number of readers.)

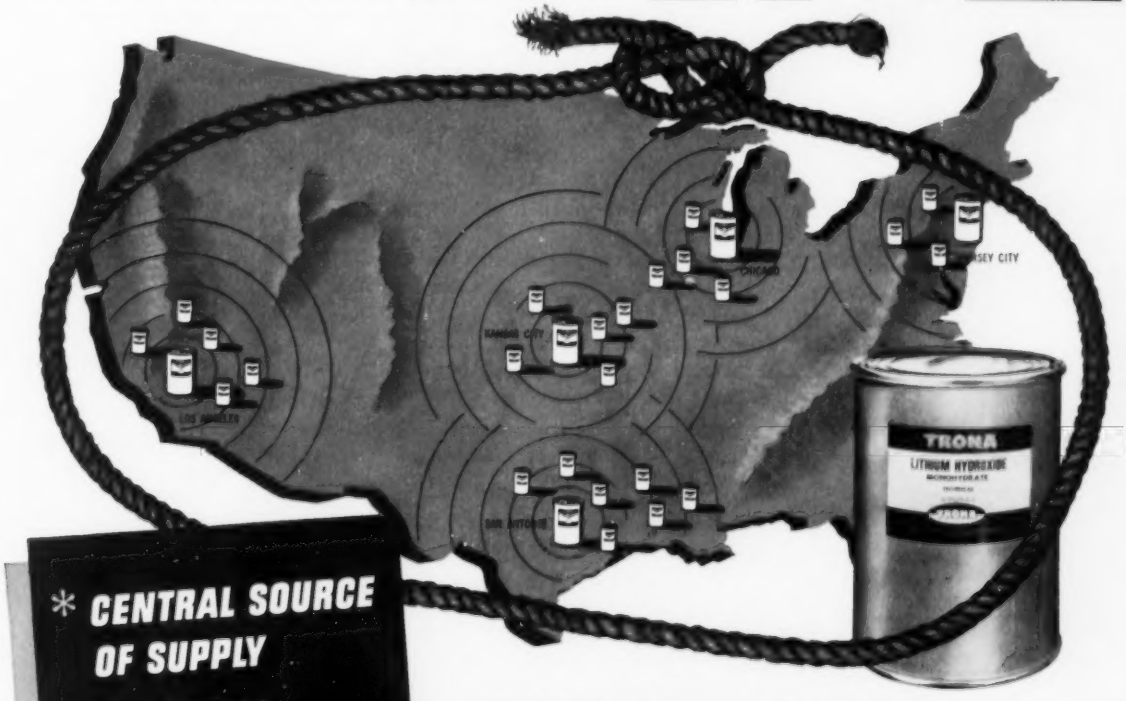
Several features are currently being prepared for eventual publication. They deal with farm lubrication, overseas marketing methods, sales problems and development of new products.

NLGI Spokesman readers are invited to submit papers dealing with sales, distribution, sales promotion, and related subjects, subject to approval by the marketing committee. Material should be first forwarded to the national office in Kansas City.

TRONA† LITHIUM HYDROXIDE

FOR MULTI-PURPOSE GREASES

...an essential product—tied in with service



* CENTRAL SOURCE OF SUPPLY
* STRATEGIC WAREHOUSING
* BETTER DELIVERIES

GREASE MANUFACTURERS: There are three good reasons why Trona† should be your prime source of supply of lithium hydroxide monohydrate ($LiOH \cdot H_2O$), essential to the production of lithium base greases. (1) **A new and strategically located plant** at San Antonio, Texas (American Lithium Chemicals, Inc.). (2) **Convenient warehouse stocks** of lithium hydroxide, maintained in proximity to the major grease producing areas of the U. S. (see map). (3) **Better, faster deliveries,** because of advantageous rail and motor freight facilities. When planning your current, or future, requirements for LiOH we suggest you contact your American Potash & Chemical Corporation (Trona†) sales representative. His better service costs no more.

TRONA

†TRADEMARK AP&CC

American Potash & Chemical Corporation

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Producers of: BORAX • POTASH • SODA ASH • SALT CAKE • LITHIUM CHEMICALS • BROMINE CHEMICALS • CHLORATES • PERCHLORATES • MANGANESE DIOXIDE *and a diversified line of specialized agricultural and refrigerant chemicals.*

Plants: TRONA and LOS ANGELES, CALIFORNIA
HENDERSON, NEVADA
SAN ANTONIO, TEXAS (American Lithium Chemicals, Inc.)

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H-14

HARCHEM DIVISION
WALLACE & TIERNAN, INC.
SUCCESSOR TO W. C. HARDESTY CO., INC.
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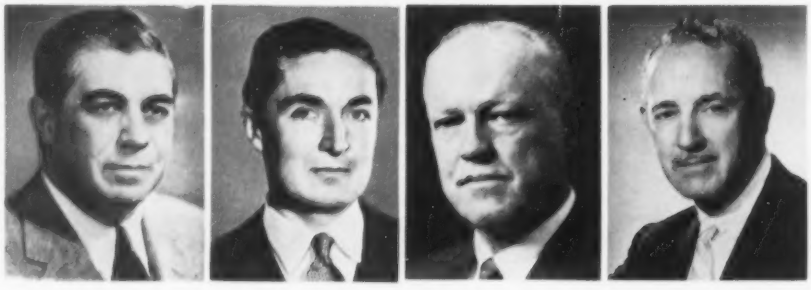
PEOPLE in the Industry

SHELL NAMES THREE VICE PRESIDENTS AND DIRECTOR



Eddy | Loudon | Thomas | Wadlow

Selwyn Eddy, P. C. Thomas, and J. L. Wadlow, Shell Oil Company general sales managers for the West Coast, Midwest, and East Coast, were named vice presidents today by H. S. M. Burns, president.

The new vice presidents will continue to direct the company's marketing activities in their present areas under the general direction of J. G. Jordan, vice president for Shell's nation wide marketing operations.

Mr. Eddy, general sales manager for the West Coast, started with Shell in 1925 as a service station salesman in San Francisco. In 1935 he was named manager of Shell's southern California marketing operations and later headed marketing divisions in Detroit and New York. He was promoted to Midwest general sales manager in 1951 and was transferred to the West Coast in 1954.

Mr. Thomas had served as general sales manager of both the East and West Coasts prior to being named Midwest general sales manager in 1954. His earlier assignments included division manager, in St. Louis and Los Angeles, and district manager in Houston. Mr. Thomas, a native of St. Louis, joined Shell there as a salesman in 1932.

Mr. Wadlow, who joined Shell in 1926 as a service station salesman in St. Louis, became East Coast general sales manager in August, 1954, after three years as West Coast general sales manager. From 1941 to 1951 Mr. Wadlow was manager of the company's Atlanta division. Previously he had headed the Indianapolis and Florida divisions.

J. H. Loudon has been elected a member of the board of directors of Shell Oil company. Mr. Loudon has served with various affiliated and associated companies throughout the world, and he now is general managing director of Royal Dutch Petroleum company and chairman of the board of Shell Caribbean Petroleum company.

Mr. Loudon replaces Dr. H. Bloemgarten on the Shell Oil board. Dr. Bloemgarten, who has retired, served as a vice president of Shell Oil company prior to 1947 when he became a director of the company and a managing director of Royal Dutch Petroleum company.

Continued on page 49

American Lubricants' Fitzpatrick Receives Honors

Paul E. Fitzpatrick, chairman of the board of American Lubricants, Inc., was recently appointed trustee of Cornell University. Fitzpatrick is an alumnus of Cornell. He graduated from the University in 1920 with a degree in engineering. Fitzpatrick was also honored by Canisius College this year when he received the honorary degree of Doctor of Laws for his outstanding work in local and national circles. With a substantial background in grease manufacturing, Fitzpatrick joined American Lubricants, Inc., in 1930, at which time he was made vice-president and treasurer. Since that time he has contributed greatly to the expansion and progress of the company as an independent grease manufacturer.

Personnel Appointments Announced by Acheson Colloids

Acheson Colloids company, Port Huron, Michigan, has just announced the appointments of E. Ralph Egloff and Frank H. Mrozek as service engineers. Mr. Egloff has been assigned to the Chicago sales office of the company, while Mr. Mrozek will be located in Acheson Colloids' New York office.

Mr. Egloff graduated from Loyola University, Chicago, with a B.S. degree in Commerce and Marketing in 1954. He also attended the University of Mexico City. His business background includes two years of industrial sales, during which time he represented machine tool firms in the Chicago area. He is a member of the national honor society, Pi Gamma Mu, the American Marketing Association and the Manufacturers Representatives National Association.

Egloff Mrozek

Mr. Mrozek, prior to joining the Acheson organization, was a technical assistant at the Bell Telephone Laboratories for four years. He served in the Signal Corps from 1948 to 1952, part of the time as an instructor at the Fort Monmouth Signal School.

Socony Appoints Schmidt General Counsel

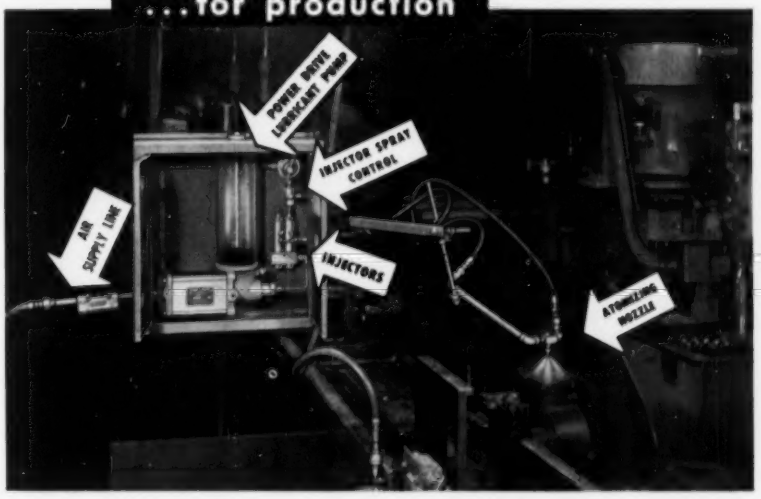
Herman J. Schmidt, associate general counsel, was elected general counsel of Socony Mobil Oil Company, Inc., by the board of directors. In that position, he succeeds Austin T. Foster, general counsel since 1948 and a member of the board since July, 1955.

Mr. Foster continues as a member of the board, with the Office of the General Counsel among the departments in his portfolio.

Speed Up ASSEMBLY LINE SPRAY APPLICATIONS

***Lincoln* MistOmatic System**

...for production



MistOmatic spray control arranged alongside production line automatically applies lubricant mist to gear box components.

AUTOMATIC ASSEMBLY LINE APPLICATION of paint, glue, grease, oil

Lincoln pioneers a major step toward complete assembly line automation... to boost your profits! The MistOmatic Spray is being used through industry—with great success—for production line spraying of grease, oil, paint, glue and similar materials. Quantity of material sprayed, timing and pattern of spray, adjusted to your needs.

These valve assemblies can also be used *without* spray attachment for automatic application of various materials to production components, and for automatic application of such fluids as die lubricants. Get complete details now!

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Information and specifications on how you can "build in" Automatic Maintenance and Automatic Spray applications for your *automated lines... machine tools... production equipment... materials handling equipment!* Write today!

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NEW MEMBER

Ampol Petroleum, Ltd. Joins NLGI as an Active Member

THE HISTORY OF Ampol Petroleum Limited—Australia's fast growing and energetic young oil company—is really a biography of William Gaston Walkley, the managing director of the company.

In turn telegraph messenger boy, soldier, and chartered accountant, the rugged 59-year-old New Zealander has become a top power in Australia's oil and petrol merchandising industry and is leader of the group sponsoring the greatest search for oil in the country's history.

He was born in Otaki, N. Z. His first job was with the Wellington General Post Office. Later he took degrees in accountancy. In World War I he served as an infantryman with the New Zealand Expeditionary Forces.

Mr. Walkley's first contact with the oil industry came in 1922. He was accountant, secretary and chief executive of the country's Motor Union, policy-making body for all motor associations. He saw the need for a local petrol merchandising firm to import and sell cheaper fuel.

Mr. Walkley and the Chairman of the Union could get no aid from the Government. So with typical aggressiveness, they decided to start their own company. With £5,000 they formed the N. Z. Associated Motorists Petrol Co.

His first taste of the oil industry fired Bill Walkley's imagination.

He left his homeland for Australia, and in Sydney in 1936 he organized the Australian Motorists' Petrol Co. Ltd., the forerunner of today's Ampol Petroleum Limited.

Since its inception the company has built up an impressive number of 'firsts." Here are some:

1936—The Company became the first petroleum marketing organization to make its shares available to the Australian public.

1937—Ampol were the first to introduce electric pumps to Australia.

1938—The Company became the first to market a super-octane petrol.

1949—Ampol ended petrol rationing by importing non-dollar petrol.

1953—The tanker, "William G. Walkley," was launched, the largest Australia-owned ship.
Oil was discovered in Western Australia.

Company Representative

W. G. Askins

Technical Representative

W. G. Walkley

1954—The first Cornell oil blending plants in Australia were set up in Melbourne and Sydney.

1955—Ampol became the first Australian Company to build steel and glass service stations as standard constructions.

But the merchandising of oil products was not sufficient for W. G. Walkley. He wanted to find oil. He had a hunch there was oil in Australia in commercial quantities, despite claims by distinguished men that the country, geologically, was too old. His idea however, was supported by the Australian Director Mineral Resources, Dr. H. C. Raggatt, who suggested that Exmouth Gulf, on the N. W. Coast of Australia was likely oil-bearing country. Mr. Walkley then went overseas in search of finance.

London evinced no interest, so he travelled on to New York. Again he found little support.

The area in discussion had been examined by two of the largest oil producing companies with little success and they couldn't support Mr. Walkley's enthusiasm.

So he travelled to the West Coast, to Los Angeles and to San Francisco. There he talked with Frank A. Morgan, then vice-president of the Richfield Corporation . . . and found interest.

Mr. Morgan remembered the reports of U. S. geologists, who, as wartime pilots, had flown over the area and

believed the country to be almost a replica of the rich oil-bearing West Texas structure.

Mr. Morgan visited Australia in 1947 and later sent U. S. geologists to make further examinations of the exmouth Gulf area. When agreement had almost been reached, the Richfield Corporation suddenly withdrew, but it offered to find other backers.

Two other tentative agreements followed with other oil interests but both broke down.

Undaunted, Mr. Walkley made a fourth contact—with Caltex—and in mid-1952 an agreement was signed.

"That's that," commented Walkley after the signing. "Now, all we have to do is find some oil."

And they found it. On December 5, 1953, the announcement burst on the world that oil had been discovered at Rouge Range in Exmouth Gulf. The find was not extensive but it suggests the probability of large accumulations.

The search still continues and by the end of this year the operating companies will have spent £13,000,000 in oil exploration.

Wilfred Gordon Askins, 38-year-old Sydney (Aust.) born lubricants manager of Ampol Petroleum Limited is one of the most recent marketing and technical representatives appointed to the NLGI.

He has been, in turn, student, advisor, manufacturer and finally leader in the lubricant field of the fast-growing Australian company.

Askins began his career in the metallurgical laboratories of several leading Australian steel mills.

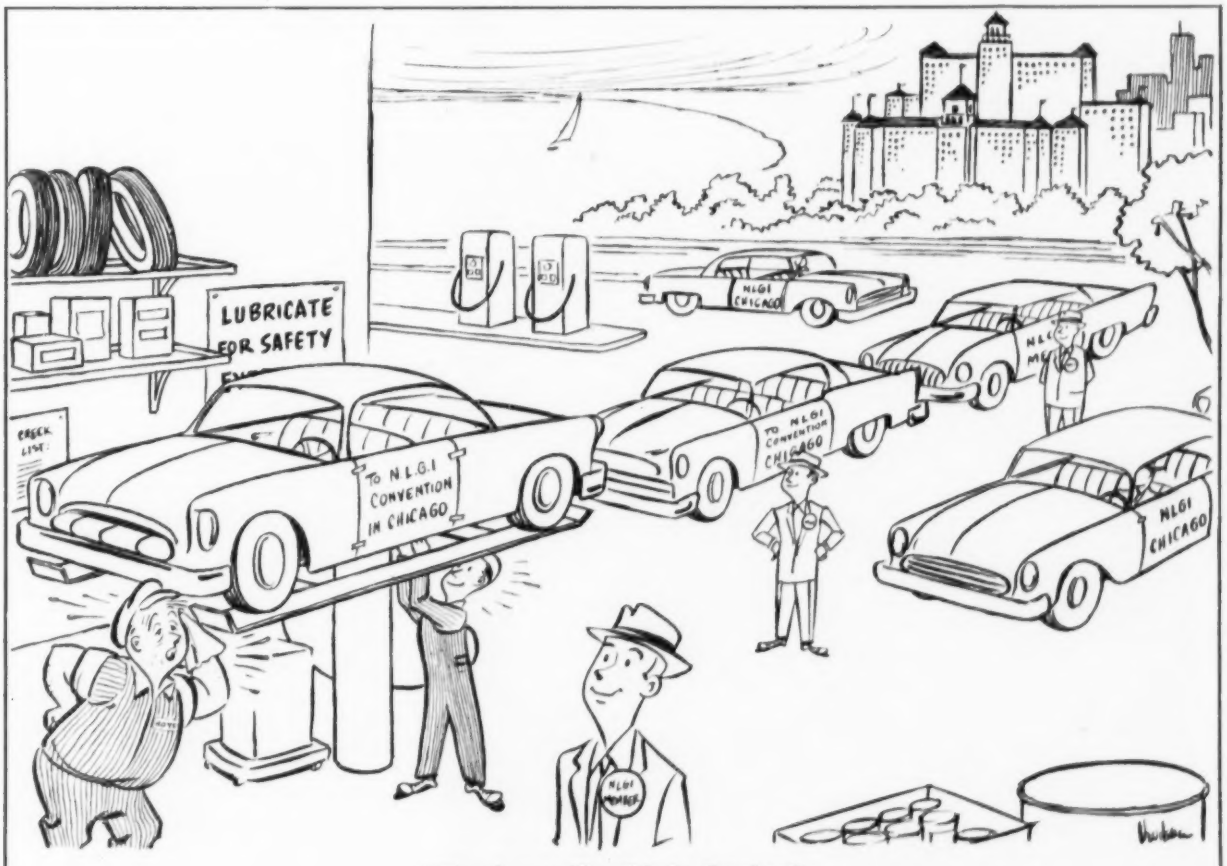
During this period he gravitated to the oil industry through the task of preparing specialized lubricants for general engineering purposes.

Later he became the manager of Australia's top reclamation plant, based in Sydney.

He established his own business as the manufacturer of greases for heavy industry.

In 1952 he joined Ampol and became lubricants manager. Last year he visited the U.S.A. to study grease manufacturing with Mead Cornell, inventor of the Cornell blending and homogenizing unit. While there he attended the NLGI convention in Chicago.

Hoyst Ledpantz... and Lubricating Larry



"It's always like this in October"

worth
investigating
9:10, 12:13 – OCTADECADIENOL – LINOLEYL 9:10, 12:13, 15:16 – OCTADECATRIENOL – LINOLENYL
ADM's
UNADOL 40
AND
UNADOL 90
Hydrafol PRODUCTS
Hydrogenated and Distilled Fatty Acids and Stearic Acid . . . Hydrogenated Vegetable, Fish, Sperm Oil and Tallow . . . Hydrogenated Castor Oil . . . Stearyl, Cetyl, Oleyl Alcohol . . . Sperm Oils and Spermaceti . . . Behenic Acid . . . Erucic Acid . . . Hydroxystearic Acid.
UNADOL 40 and UNADOL 90—two more new fatty alcohols—are now available from Archer-Daniels-Midland.
The new unsaturated alcohols are liquids—almost water-white. The principal component of UNADOL 40 is linoleyl which possesses two double bonds. The principal component of UNADOL 90 is linolenyl which contains three double bonds.
The double bonds and the one Hydroxyl group offer limitless possibilities for chemical reactions. Successful product advantages are very likely in manufacturing new protective coatings, resins, surface active agents and chemicals.
Now available for immediate shipment in tank-car or LCL quantities from Ashtabula, Ohio. For samples—and for our new bulletin with chemical reactions of 30 new fatty alcohols, write on your letterhead.
Chemifats that put SELL into your products
Archer·Daniels·Midland company
CHEMICAL PRODUCTS DIVISION
2191 WEST 110th STREET • CLEVELAND 2, OHIO

Succeeding Mr. Schmidt as an associate general counsel is John J. Scott, who has been an attorney with the company since 1945.

Mr. Schmidt, who is 39 years old, was born in Davenport, Iowa, and attended high school there. He received his A. B. degree, with highest honors, from the University of Iowa in 1938. Three years later he was graduated with honors from Harvard Law School, where he was an editor of the Harvard Law Review.

He was associated with Cravath, Swaine and Moore in New York City prior to joining Socony Mobil as tax counsel in 1951. He was made administrative assistant to the general counsel on January 1, 1955, and an associate general counsel on July 1, 1955.

Lehigh Chemical Appoints B. K. Moores

The Lehigh Chemical corporation of Chestertown, Maryland, announces the appointment of Billy Kaye Moores as director of industrial marketing for the corporation.

Mr. Moores, formerly eastern district sales manager for Myzon, Inc., will be in charge of new product development for both industrial and consumer products. His appointment is a part of the new Lehign merchandising program through which they will offer lubricants for the consumer market in addition to their original field of engineered lubricants for industry.

Schnewlin Joins Swiss Member Adolf Schmids Erben

Gordon Schnewlin will return to his native Switzerland this month after four years of work here in this country as a grease engineer. He will join the firm of Adolf Schmids Erben, Inc., an active NLGI member located in Berne, Switzerland. Schnewlin recently visited the national offices of NLGI and IOCA in Kansas City where executive secretaries Miller and Mathews took him on a tour of Battenfeld and Jesco grease operations and the Phillips refinery. Battenfeld's chief research chemist, C. J. Boner acted as host through his company's plant. Schnewlin also met Battenfeld's president, A. J. Daniel. During his tour of Jesco, Schnewlin met president Claude Johnson and chief chemist J. J. Dickason.

EMERY ADDS THREE TO RESEARCH AND SALES STAFF

Sonntag

The appointment of Dr. Norman O. V. Sonntag to the research staff of Emery Industries, Inc., Cincinnati, O., is announced by R. C. Kadesch, director of research.

Dr. Sonntag will be connected with the process research section under the direction of V. J. Muckerheide where he will be in charge of research in the fast growing field of synthetic lubricants for jet and gas turbine engines. He formerly was chief chemist for the chemical division of the Celanese Corporation of America.

Dr. Sonntag is a native of Brooklyn, N. Y., and holds the degrees of B.S. and Ph.D. from Brooklyn Polytechnic Institute.

He is affiliated with the American Chemical Society, the American Oil Chemists, the British Chemical Society, and Signa Xi.

Connelly

Robert F. Connelly has been assigned as the west coast field salesman for the organic chemical sales department of Emery Industries, Inc., according to R. F. Brown, organic chemical sales manager. Connelly will be responsible for sales of all organic chemicals including plasticizers, dibasic acids, synthetic lubricant bases, textile chemicals, soluble oil bases, and special derivatives.

Mr. Connelly holds a B. S. degree in organic chemistry from the California Institute of Technology. Prior to his joining Emery, he was associated with the Bray Oil company in research and development and the Shell Oil company in a similar capacity.

Currently, Mr. Connelly is a member of the American Chemical Society, American Institute of Chemists, National Association of Corrosion Engineers, Society of Aircraft Materials and Process Engineers, Pacific Railway Club, and is the secretary-treasurer of the American Society of Lubricating Engineers.

Lefler

The assignment of Albert L. Lefler to handle sales of Emersoft Softeners, Twitchell Oils for Sanforized Fabrics, and Twitchell Wool and Worsted Oils in North and South Carolina has been announced by R. F. Brown, Manager of the Organic Chemical Sales Department of Emery Industries, Inc.

Mr. Lefler is a graduate of Clemson College. Formerly with Sayles Biltmore Bleacheries, Inc., of Biltmore, N. C., Mr. Lefler has had extensive experience in the finishing of Textile fabrics.

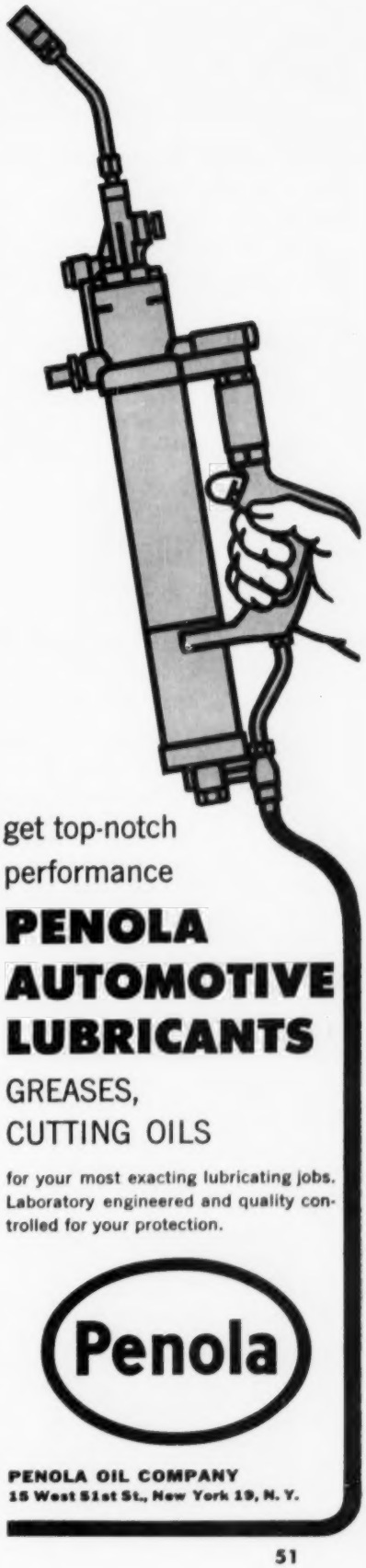
VULCAN PROMOTES FERGUSON TO SALES MANAGER

Ferguson

Lawrence M. Ferguson, an 18-year veteran with Vulcan Containers Inc., of Bellwood, Ill., has been promoted to sales manager, it was announced by Herbert B. Scharbach, vice president for sales.

An authority on interior coatings for steel shipping containers, Ferguson has been instrumental in the research and development of the company's techniques in varied coatings for the interior of steel shipping pails making them suitable for packaging such diverse products as foods, chemicals, and petroleum products.

Ferguson also has been instrumental in the development of Vulcan's storage warehouse facilities at the Bellwood plant, which are reputed to house the world's largest supply of steel shipping containers. Many of these are made to order.



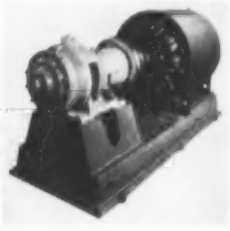
Industry NEWS

Chemicolloid Announces Features of New "G" Series Mill

In response to the growing demand for a larger colloid mill to serve the grease industry, Chemicolloid Laboratories, Inc., has designed a line of Charlotte colloid mills, designated as the "G" series, for this service.

20% to 40% Increased Capacity

This new "G" series offers 20% to 40% increased capacity, and incorporates all the improvements suggested by grease processors for their particular requirements. Based on over thirty years of manufacturing experience in the colloid mill field, the series has been completely re-designed and constructed for heavy duty and rugged endurance.



G-125 handles 25,000 lbs. per hour

Among the new design features: a front end removable shaft seal, which simplifies maintenance and adjustment of rotary seal for non-abrasive service; flushed seal for abrasive or hazardous service; or conventional packing—either Teflon or metallic type, over-size radial and thrust bearings; supporting rugged shaft operating at 3600 r.p.m. greatly minimizes downtime.

The mill is fed and discharged under constant pressure, eliminating aeration of product being handled. The same distinctive rotor and stator —the "Charlotte Principle"—produces stable emulsions and fine dispersions as well as uniformly suspended solids through the closed system identified with the Charlotte colloid mill.

Production as high as 50,000 lbs.

The largest model in this new "G" series, the G-125, powered with 125 h.p. motor, handles viscous materials and heavy greases at a rate of up to 25,000 pounds per hour. Production of less viscous materials will range up to 50,000 pounds per hour. The new "G" series includes units of 100 h.p., 30 h.p., and a pilot plant unit with 3 h.p. motor. Additional sizes will be added in the near future as they are required.

Standard material of construction is cast iron with hardened steel rotor, stator and shaft. Cast steel or stainless steel construction is available for special requirements of processing.

Primarily designed for the grease industry, the first G-125 unit was thoroughly test proven in one of the major grease plants in the country prior to a formal announcement. Applicable also to the asphalt and tar emulsion, wood pulp binders, clay coatings, and other heavy production chemical, petroleum and textile fields, its principal function is directed to the lubricating grease industry.

Alpha Molykote Newsletter Features Connections

The lubrication of threaded connections is featured in the second issue of the Lubrication Newsletter now available from The Alpha Molykote Corporation, Stamford, Connecticut.

The lead article is a technical description of the causes of galling and seizing in threaded connections and power screws and procedures for lubrication to practically eliminate these problems. Descriptive charts show coefficients of friction as calculated from both torque wrench measurements and test data using a threaded assembly.

Also included in the issue are application stories of extreme pressure lubrication on a steam turbine and on the loading screws of the world's largest universal testing machine.

Copies of the Lubrication Newsletter may be obtained from The Alpha Molykote Corporation, Stamford, Connecticut.

NEVER UNDERESTIMATE THE IMPORTANCE OF LUBRICATION!

There's **POWER, PERFORMANCE, PROFIT**

in the use of **mbi** lubricants!

mbi ON GUARD SINCE 1888

MAGIE BROS. OIL CO.

9101 Fullerton Ave., Franklin Park, Ill., Chicago Phone TUxedo 9-4800

New Trademark for American Potash

American Potash & Chemical Corporation has adopted a new streamlined trademark for its complete line of Trona tradenamed products.

Adoption of the new trademark is one of the final steps in the company's program to modernize its product packages and labels, according to William F. J. Francis, vice-president in charge of Sales.

The redesign program was begun three years ago and included a complete revamping of package designs and product labels for American Potash & Chemical Corporation's more-than-60 products.

Purpose of the change in design, according to Francis, was "to combine efficiency with eye-appeal to provide better servicing for company customers."

The new trademark includes the company's long-used oval design, with a white large-lettered Trona imprinted on a background of blue and orange.

Previously, the company's trademark included, in addition to the Trona name, two of its subsidiaries and the line, "Industrial and Agricultural Chemicals."

"The simplified design not only has considerably more eye-appeal," Francis said, "but is legible from a distance between two and three times greater than the former design."

American Potash Opens Capitol Office

American Potash & Chemical Corporation has announced the establishment of offices at Washington, D. C., for the purpose of improved liaison between governmental agencies and the company's Department of Defense Programs, according to an announcement by George S. Wheaton, company vice-president, Defense Programs.

Herbert W. Yeagley has joined American Potash & Chemical Corporation to head the Washington office, reporting to Wheaton at the company's Los Angeles headquarters. The Washington office will be located in the Investment Building at 15th and K Streets.

Yeagley, who was educated at Alabama Polytechnic Institute (Auburn), came to American Potash & Chemical Corporation from Monsanto Chemical Company's Inorganic Chemicals Division at St. Louis, Mo., plant where he was manager of the Sales-Production Liaison Department. Yeagley had been with Monsanto since 1942, being assigned to their Washington office from 1946 to 1951.

Chek-Chart's Tractor Guide Now Ready

The Chek-Chart corporation announces the publication of the eighth edition of its Farm Tractor Lubrication Guide.

Incorporated in the 96 pages are 80 tractor lubrication charts, the rules for safe tractor operation and five pages of special instructions providing illustrated service procedures. The purchase price includes a *Service Bulletin* subscripition and the new supplemental *A Semiannual Review of Tractor Service Changes* reporting all pertinent tractor manufacturers' changes.

Continued on page 54

An introductory analysis of Guide value and use shows that The Man With The Guide knows not only the location of service points, but the types and grades of lubricants recommended by manufacturers as well as the capacities and service intervals of all popular farm tractor models now in use.

For tank truck salesmen and others dealing with individual farm tractor maintenance, or for oil marketers planning concentrated farm promotional programs, The Guide is an invaluable aid. Further arrangements may be made to secure individual charts for personal presentation to each farm account.

Additional information may be received from The Chek-Chart Corporation, Sales Department, 33 East Congress Parkway, Chicago 5, Wabash 2-6330.

Shell's New Engine Lab Improves Test Methods

Experimental gasoline and motor oil for cars not yet on the road are being tested in a new research unit at Shell Oil Company's Wood River, Ill., refinery.

THREE KEY MEN

For Petroleum Product Research

1. FUELS DIVISION HEAD

Creative chemist or chemical engineer with minimum of five years experience in initiating and supervising research programs on gasolines, jet fuels and fuel oils.

2. LUBRICANTS DIVISION HEAD

Imaginative chemist or chemical engineer with minimum of five years experience in initiating and supervising research programs on motor oils, greases, industrial oils and specialty lubricants.

3. ANALYTICAL DIVISION HEAD

Versatile chemist with minimum of five years experience in physical testing and chemical analysis of petroleum products. Must have supervisory background and sound knowledge of routine and non-routine analytical methods, both wet and dry, for petroleum products.

All three key men should have experience in hiring, training and directing technical and non-technical personnel.

Salaries are open.

These positions are in a new laboratory being built between Cranbury and Hightstown, New Jersey, adjacent to the Jersey Turnpike. This laboratory is part of a major expansion in a rapidly growing research organization offering excellent opportunities for professional development.

Positions for chemists and chemical engineers with 0-3 years experience in fuels research, lubricants research or analytical techniques are also open. Confidential consideration will be given to all inquiries. Send details on experience, education, availability, salary and references to:

Manager Product Development
Cities Service Research and Development Company
70 Pine Street, New York 5, New York

CITIES SERVICE

A. H. Boultbee, manager of the firm's manufacturing research department, said the facility is the first that can give "road test" results on gasoline and motor oil faster and more accurately than fleets of test cars driven on roads. He said the new unit contributed important research leading to the firm's new Super Shell gasoline.

The chief test equipment is a bank of 12 new automobile engines with high compression cylinder heads. Preset instruments make the engines start, accelerate, idle, stop, or run at normal cruising speed. Automatic recorders give instant, accurate reports on gasoline, motor oil and engine performance.

Test Results More Accurate

Test results from the new research unit are more accurate than those from conventional road tests, Boultbee said, because varying traffic conditions and driver techniques keep the performances of cars in a given test fleet from being strictly comparable.

The engines run the equivalent of 20,000 miles, then are completely rebuilt.

Control equipment includes four electronic units, each unit running three engines on a predetermined test cycle. Performance is indicated on 12 instrument panels. Malfunctioning such as plug fouling or preignition is spotted instantly.

Boultbee said the research unit is now using experimental engines with 10-1 compression ratio heads. Engine types are changed periodically to permit tests of fuels designed for the high compression engines of the future.

The laboratory is designed primarily for research but can be used in comparing Shell gasolines and motor oils with competitive products.

Superior Solves Leakage From Threaded Pipe Joints

For 15 years the Superior Manufacturing Company of Albert City, Iowa, searched for some way to remedy a recurrent, dangerous situation in the plating department. Cyanide zinc plating solution persisted in leaking from numerous threaded pipe joints in the plating solution filtration system and pipes leading to the plating room.

The problem was not one of chemical waste, since the solution is inex-

pensive. Here was a real occupational hazard. As the solution evaporated on the pipes, unsightly cyanide salt formations developed over much of the equipment. This posed a constant threat to plant personnel. The cyanide containing deposits could be fatal if accidentally ingested. Even skin contact could have serious effects.

After 15 years of trying every known kind of pipe-joint cement, including litharge and glycerine, Superior was still unable to eliminate the leagage problem. Over the years housekeeping costs mounted; the crusty, poisonous deposits were difficult to remove.

Finally a graphite dispersed in petroleum oil known as "dag Dispersion No. 204" was applied for experiment. Ready for use directly from the container, the compound was brushed on to the joints during assembly. Maintenance personnel discovered that threads could be drawn up tighter and with less effort, affording positive protection against leakage. Also, the lubricating, non-corroding character of this 'dag' dispersion permitted easy separation.

"Recently," states President Sundholm, "I checked all the pipe joints and found them perfectly clean after many months of continuous service. Joints were still tight; there was no sign of leakage or disintegration. 'Dag' Dispersion No. 204 proved to be the answer to this serious leakage headache."

'Dag' Dispersion No. 204, manufactured by Acheson Colloids Company of Port Huron, Michigan, is made of pure electric-furnace graphite that is processed to microscopic size and dispersed by Acheson's exclusive methods. The product meets U. S. Military Specifications MIL-C-907 (Ships). 'Dag' semi-colloidal graphite is chemically inert. Its insolubility in acids and alkalies prevents chemical reaction with these corrosive materials and subsequent loss of lubricating ability.

Enterprise Changes Name To Quaker State

One of NLGI's foundation members, Enterprise Oil Company, Inc. is now a manufacturing division of the Quaker State Corporation. The same address will be maintained at Oil City, Pennsylvania.

Since "way back when," Monsanto has been helping lube manufacturers like you with the chemical problems of petroleum additives.

Modern Example:

IMPROVING GEAR LUBE PERFORMANCE TO MEET THE EXACTING MILITARY AND AUTOMOTIVE SPECIFICATIONS FOR HIGH-TORQUE, HIGH-SPEED OPERATION

What was needed was a true multi-purpose additive that would help heavy-duty gear lubricants stand up under the extreme pressures of high torque without sacrificing high-speed performance. Monsanto chemists developed Santopoid 22 and Santopoid 22 RI.

Gear lubes fortified with either . . . passed both high-speed and high-torque field trials in all automotive equipment tested on desert runs and mountain runs for 3 years . . . in 1954, 1955 and 1956.

Superior High-Torque Performance . . . for the past year Santopoid 22 has protected expensive heavy-duty worm-gear trucks used in grueling mountain hauling.

Excellent High-Speed Protection . . . before adding Santopoid 22, a racing car chewed up rear-end gears every 75-100 miles. Since changing to a Santopoid 22 fortified gear lube, 350 miles plus 100 warm-up miles have been clocked with gears still OK.

When you write specifications for your product, before investing in expensive tests . . . call in Monsanto. Monsanto can formulate your base stock—ready for field testing—with dozens of possible additives that will do just about any job an additive can do. Corrosion inhibitors • Detergents • Viscosity index improvers • Gear lubricant fortifiers Fuel oil clarifiers • "Oiliness" improvers.

For more information, write to:

Monsanto Chemical Company

Organic Chemicals Division

Department OA-2

St. Louis 1, Missouri

MONSANTO

SANTOPOID REG. U.S. PAT. OFF.

Lithium Corporation Completes First Construction Phase in High Energy Fuels

Lithium Corporation of America, Inc., announced completion of the first phase of its expansion program for the production of lithium metal and its derivatives for use in the field of high energy chemical fuels.

Company spokesmen stated that rapidly increasing industrial demands for lithium metal and its derivatives will require further expansion of these facilities in the immediate future.

Valvoline Sponsors 62,000 Mile Auto Tour

Starting from Switzerland 31 months ago, four young Swiss citizens have been touring South America, Mexico and the United States in a 1948 Buick. They use Valvoline oil exclusively and recently stopped at the Valvoline refinery at Freedom to tour the modern plant.

The Buick, which was assembled in the G.M. plant at Bienne, Switzerland, has a special Swiss-made trailer attached, for transportation of baggage and technical equipment.

The expedition left Lausanne, Switzerland, on October 23, 1953, and embarked at Le Havre for Rio De Janeiro, Brazil. From there it has crossed, always by land, Brazil, Uruguay, and all of Argentina, arriving at Tiena Del Fuego. From that point, the four tourists traveled through Mexico, using the Pan-American Highway, into El Paso, Texas. From there the travelers took a southern route to New York City, and then to Pittsburgh.

They plan to visit all of the 48 states and Canada; where they will follow the Alaskan Highway to Fairbanks, the most northern situated point in Alaska.

Four Swiss citizens have a look at Valvoline warehouse during 62,000 mile Valvoline car tour.

Their entire trip represents a tour by car of 62,000 miles and will last approximately three years.

The leader of the expedition is 32-year-old H. M. Berney, who is the radio reporter, newspaperman and photographer of the group. His pretty wife acts as secretary, nurse and special assistant.

The third member is Renato Della Zoppa, 36, who serves as interpreter and handles public relations.

Haubansak Is Able Mechanic

The mechanic of the group is 25-year-old Marcel Haubansak, whose excellent knowledge of automobile mechanics is responsible for the perfect working condition of their 8-year-old Buick. He is quite proud of the fact that the car represents the ultimate in technical equipment. It is an ordinary series Buick, but has been equipped with a great number of precision instruments and accessories.

Compressors Give Added Power

The power of the motor was increased considerably by adding two low-pressure compressors, which were of considerable benefit in crossing the Andes Mountains. An extraordinary dash-board has been added, containing many extra instruments and controls. The car radio is specially made with 6 short-wave bands permitting the reception of Swiss broadcasts in any part of the world. Also attached to the dash-board is a specially adapted percolator, which makes fresh coffee while the group is traveling.

The Swiss window glass in the Buick is also a new experiment. Each window contains minute electric filaments, which controlled by the driver, warm the panes, eliminating frost, thus avoiding dim or foggy windows in winter.

HARSHAW LEAD BASE

Harshaw Lead Base, as an additive to petroleum lubricants, improves extreme pressure characteristics and imparts the following desirable properties:

- Increased film strength
- Increased lubricity
- Improved wetting of metal surfaces
- A strong bond between lubricant and metal surfaces
- Resistance to welding of metals at high temperatures
- Moisture resistance and inhibits corrosion

Harshaw Lead Bases are offered in three concentrations to suit your particular needs:

Liquid 30% Pb	Liquid 33% Pb	Solid 36% Pb

Other metallic soaps made to your specifications. Our Technical Staffs are available to help you adapt these products to your specific needs.

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Mobil Automotive
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Industrial
Oils and Greases

SOCONY MOBIL OIL CO., INC., and Affiliates:
MAGNOLIA PETROLEUM COMPANY
GENERAL PETROLEUM CORPORATION

Socony Mobil's Own Building Now Completed

Socony Mobil Oil Company has kept carpenters and builders busy for many months completing a new 45-story skyscraper in midtown Manhattan. The building was completed in September and after seventy-one years at the famous Broadway address, number "26", Socony has moved to the Socony Mobil Building at 150 East 42nd Street.

Number 26 was originally a nine-story building built in 1885 after Rockefeller purchased the property for $450,000. It was often termed the oil capital of the world.

The new Socony building occupies an entire block between 41st and 42nd streets, bounded by Lexington and Third Avenues. The exterior is structural glass and stainless steel. A three dimensional pyramid-like pattern eliminates all horizontal surfaces so that the building is entirely self-washing by rain. The building is completely air conditioned and fireproof and has thirty-six self operating elevators.

There is a lounge area of 4,000 square feet and a large portion of carpet in one lounge can be rolled back for dancing. The library and card area is adjoining.

The concourse floor has a direct connection to Grand Central Station and the Lexington Avenue IRT Subway. There are many facilities housed in the building, including a branch of the First National City Bank and a Woolworth Store.

Climax Readies Guide Bulletin on Molybdenum Chemicals

"A Guide to Sources and Applications of Molybdenum Chemicals," a new 4-page bulletin has been issued by Climax Molybdenum Company. The bulletin presents information which will help industrial users to select the most economical and convenient starting materials for current molybdenum chemical applications. These include catalysts, fertilizers, pigments, lubricant additives, metal treating compounds, ceramic frits and colors, and analytical reagents.

A chart shows high-tonnage molybdenum chemicals produced and supplied by Climax, together with other compounds made by chemical manufacturers from some of these materials. The end-use industries of these molybdenum chemicals are indicated.

Over 50 developmental molybdenum chemicals currently manufactured for research purposes are listed in the bulletin. A listing of selected technical bulletins on the uses and properties of molybdenum chemicals is also included.

Copies of the bulletin, designated Ch-27, are available from Climax Molybdenum Company, Dept. L, 500 Fifth Avenue, New York 36, N. Y.

Republic Steel Constructs New Plant

A plant for the production of steel barrels in the vicinity of Charleston, West Virginia, will be constructed by Republic Steel Corporation, T.F. Patton, president, recently announced. Mr. Patton said that approximately 10 acres of land near Nitro, West Virginia, approximately 12 miles from Charleston, had been taken under option for the barrel plant. "The area

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around Charleston is considered one of the largest chemical producing centers in the country," Mr. Patton said. "The chemical industry is a large consumer of 55-gallon barrels. With many large potential users of this product nearby, Charleston is a logical spot for us to set up facilities for production of various kinds of 55-gallon barrels."

The plant at its outset will employ approximately 50 production employees, and a small staff of office workers. Equipment will be housed in a new building having floor space of approximately 45,000 square feet.

Republic has been in the steel barrel business for many years. Its entire facilities to date for the production of this product have been in Niles, Ohio.

Mr. Patton said that the construction of the Charleston plant would have little effect on the business of the Niles plant.

The new facilities will be engineered to produce more than 1,000,000 barrels per year. Provisions for expansion of this output when and if necessary will be made, he added.

The chemical industry has good growth potential and our plant will be designed to grow with it, he said.

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INTERSTATE OIL CO. REORGANIZES KEY MANAGEMENT

Beal Asplund Gray True

One of the oldest western lubricant manufacturers, Inter-State Oil Co., has just announced the sale of the entire company, including all trade names, and assets to certain key employees effective October 1, 1956. This is not a surprising move since these same people are the ones who have built the company for some years. The company has manufactured and distributed a full line of lubricants for 69 years.

Stepping into the position of president and general manager is L. Wayne Beal, who went with the company in 1948 as city territory salesman, moving up rapidly to city sales manager, administrative assistant and production manager.

Vice president and general sales manager of the company is George Asplund. With Inter-State for the past 18 years, he started as territory salesman in the Wichita area, and has been sales manager since 1951.

Elected as secretary is Frank C. Rayburn, member of the board of directors and chief counsel for both the present Inter-State and the new corporation.

Earl Gray, elected as treasurer, is a company veteran of 29 years.

The officers announce no immediate change in plant or sales personnel. Heading the manufacturing operation is Earl True, with the company for the past 31 years. The entire sales organization will continue representing the company in the territory now covered.

The company is well known to NLGI SPOKESMAN readers through the story of their recovery from Kansas City's famous "Black Friday" flood in 1951, when Inter-State lost their plant and inventory. A new plant was completed in late 1953. Recently, the city of Kansas City, Kansas, and the state highway department condemned the present location to make way for a new turnpike, which means still another move and more rebuilding for these NLGI'ers.

"Our many friends and customers in this area will be most interested to know the people who have built Inter-State throughout the years will be continuing the company with the same policy of guaranteed service and integrity," retiring president Irvine S. Shepard said.

almost Everything that moves DEPENDS ON GREASE!

Almost everything that moves either in actual operation or in the process of its making . . . from gate hinges to tractor wheels . . . depends upon grease. That is why lubricants should be bought with care. You can always depend upon Deep Rock highest quality greases and lubricants. They are manufactured to give top lubrication to all moving parts.

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Oil Marketing Described In New Shell Film

Shell Oil Company tells how it sells oil—and how young men can plan careers in oil marketing.

The explanations are given in a new motion picture, "The Story of Oil Marketing." It was introduced at a New York preview for business and advertising news editors, motion picture columnists and editors of educational and petroleum trade publications.

J. G. Jordan, Shell's marketing vice president, said he believed it to be the first film to tell how the distribution and sales of goods serve the needs of a modern society.

He said "The Story of Oil Marketing" gives a clear, accurate account of a subject that film producers—until now—have apparently considered too complex for effective treatment.

"This film tells a simple story of economic principles and of jobs that put the principles to work. We think it will be a valuable contribution to public understanding of business," Jordan said.

Produced in Hollywood

The picture begins with an animated sequence produced in Hollywood. This traces the path of a lady shopping for fish in a supermarket to tell what modern marketing is and how it serves the public. It shows how competition forces each manufacturer to make the best goods he can and to offer them with the best possible service—get them to the customer when and where and how the customer wants them.

The later part of the film, done "live" on location in New York and New Jersey, tells the story of a college student who gets a summer job in a service station. He meets an oil company marketing manager and through him sees how scientist-engineer-salesmen provide products and services for motorists, railroads, airlines, farms, homes and industries.

The student learns about job opportunities by watching the specialists at work. He returns to college in the fall to complete his course and begin his career in oil marketing.

To Run 27 Minutes

"The Story of Oil Marketing" runs 27 minutes. It is produced in sound and color. It was made for Shell by Transfilm Incorporated. Prints are available free for showings to schools, church groups, and social and civic organizations.

The new film is the fifth in the company's "This is Oil" series, a motion picture portrait of the entire oil industry. Other films in Shell's library, all available free, include popular treatments of aviation and scientific subjects. Shell libraries are in New York, Chicago, Houston and San Francisco.

New Data on Lithium Compounds Available From Foote Mineral

Pertinent data on the chemical and physical properties of lithium compounds is now available in folder form from Foote Mineral Company, Philadelphia, Pa. The most reliable published information on sixteen compounds of lithium has been compiled and is augmented by much new data now being developed by the company's research department.

The 38 page folder is in loose leaf form, to provide for insertion of new data as it becomes available. Copies of "Chemical and Physical Properties of Lithium Compounds" can be obtained by writing Foote Mineral Company, 18 W. Chelten Avenue, Philadelphia 44, Pa.

ASTM Announces Symposium On Molecular Structures

A symposium dealing with research techniques useful in investigating the molecular structures of petroleum stocks boiling above 600° will be held February 8 and 9, 1957, at the Jung Hotel in New Orleans under sponsorship of Research Division IV of hydrocarbon analysis of ASTM Committee D-2, the committee has announced. Fifteen papers by authors who are acknowledged as authorities in their fields have been selected for presentation. The authors represent nine American oil companies and one from Great Britain, a paper company which is a heavy consumer of petroleum products, and two members of the faculty of the Carnegie Institute of Technology. The papers cover a wide range of research endeavor in the field of high molecular weight oils from "New Thermal Diffusion Techniques Applicable to the Separation of High Boiling Petroleum Fractions" to "Nuclear Magnetic Resonance Characterization of Petroleum."

Harold M. Smith, well-known member of the staff of the U. S. Bureau of Mines, and currently chairman of the Petroleum Chemistry Division of the American Chemical Society as well as chairman of ASTM Committee D-2 on Petroleum Products and Lubricants, will serve as moderator of

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a discussion period to be known as "the town meeting." The symposium will be held on the two days preceding the opening of the ASTM D-2 Committee meetings.

In the separation field, papers on volatility and adsorption will be presented at the symposium by B. J. Mair and F. D. Rossini, both of the Carnegie Institute of Technology; by H. C. Rampton of the Sunbury Research Station, British Petroleum Company, Ltd.; and by B. A. Orkin, Socony Mobil Oil Company, Inc. Papers on thermal diffusion will be read by A. L. Jones, Standard Oil Company, Ohio; and by F. W. Melpolder, the Atlantic Refining Company. Solvent extraction will be the subject of a paper presented by E. L. Derr, Shell Development Company.

In the field of spectroscopic methods, R. H. Hughes of Gulf Research and Development Company will read a paper on infrared; M. J. O'Neal and W. A. Bailey, Jr. of Shell Oil Company a paper on mass spectrometry; and R. B. Williams of Humble Oil and Refining Company and J. R. Zimmerman of Magnolia Petroleum Company will each deliver a paper on nuclear magnetic resonance.

In the "General Methods and Correlations" division of the symposium J. O. Knoblock of the Standard Oil Company, Indiana, will present a paper on chemical treating; S. S. Kurtz, Jr of Sun Oil Company, one on adsorption and physical property methods.

Lubrication Engineers Has New Gear Lubricant

The announcement of a new and vastly improved gear lubricant was made by J. B. Woodard, vice president and sales manager for Lubrication Engineers, Inc. of Fort Worth. These new products . . . 509 and 510 multi-purpose gear lubricants . . . were developed to off-set new problems of gear lubrication which have been brought about because of higher torque and pressure values which major equipment manufacturers have incorporated into most modern day equipment.

According to Woodard, preliminary field tests indicate that the high anti-wear properties of 509 and 510 multi-purpose gear lubricants will substantially reduce excessive wear of pinion and ring gears. Further, Lubrication Engineers, Inc., expects to reduce gear lubricant consumption in some instances as much as 400% with these new products.

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24th ANNUAL MEETING

Technical Committee Session

Chairman T. G. Roehner, Socony Mobil Oil Co.

WEDNESDAY, OCTOBER 24

9:00 a.m.-10:30 a.m. REPORTS OF COMMITTEES

NLGI Classification of Lubricating Greases
H. C. Zweifel, Richfield Oil Corporation

Procurement of Technical Papers for Publication in the NLGI Spokesman
C. J. Boner, Battenfeld Grease & Oil Corp.

Editorial Review
George Entwistle, Sinclair Refining Company

Research Fellowship
E. W. Adams, Standard Oil Company (Indiana)

Manual of Test Methods and Definitions of Terms Peculiar to the Lubricating Grease Industry
W. J. Ewbank, Cato Oil & Grease Company

Recommended Practices for Packing Automotive Front Wheel Bearings
P. V. Toffoli, Jr., The Pure Oil Company

Delivery Characteristics of Dispensing Equipment for Lubricating Greases
Gus Kaufman, The Texas Company

Steering Committee
T. G. Roehner, Socony Mobil Oil Company, Inc.

10:30 a.m.-1:00 p.m. SYMPOSIUM–Consistency Stability of Lubricating Greases During Storage

Storage Stability of Aircraft Greases
Herbert Schwenker, Wright Air Development Center

A Method for Prediction of the Hardness Changes of Greases in Storage
G. W. Eckert, The Texas Company Research Center

Discussion Period

FUTURE MEETINGS of the Industry

OCTOBER, 1956

8-10 The American Society of Mechanical Engineers (joint ASME-ASLE lubrication conference), Chalfonte - Haddon Hall, Atlantic City.

10-12 Society of Automotive Engineers (national transportation meeting), New Yorker Hotel, New York City.

11 Arkansas Independent Oil Marketers Association (annual convention), Hotel LaFayette, Little Rock, Ark.

11-12 California Natural Gasoline Association (fall meeting), Sheraton Hintington Hotel, Pasadena, Cal.

14-16 Tennessee Oil Men's Association (Fall convention), Hermitage Hotel, Nashville.

14-17 North Carolina Oil Jobbers Association (annual convention), The Carolina, Pinehurst, N. C

14-17 AIMME (Petroleum Branch Fall meeting), Biltmore Hotel, Los Angeles.

14-20 American Petroleum Institute Oil Progress Week.

15-17 American Institute of Mining, Metallurgical, and Petroleum Engineers, Petroleum Branch, Biltmore Hotel, Los Angeles.

15-17 American Gas Association (annual meeting), Atlantic City, N. J.

15-19 American Society of Civil Engineers (annual convention), William Penn Hotel, Pittsburgh, Pa.

17-18 Indiana Independent Petroleum Association (annual business meeting), Hotel Severin, Indianapolis.

17-19 National Industrial Conference Board (atomic energy meeting), Waldorf-Astoria Hotel, New York, N. Y.

18 West Virginia Petroleum Association (19th annual convention), Daniel Boone Hotel, Charleston.

18-19 Western Petroleum Refiners Association (technical industrial relations meeting), Rufus Garrett Hotel, El Dorado, Ark.

18-21 Permian Basin Oil Show, Odessa, Texas.

22-24 American Standards Association (7th national conference on standards), Roosevelt Hotel, New York City.

22-24 NLGI Annual Meeting, Edgewater Beach Hotel, Chicago, Ill.

22-24 Rocky Mountain Oil & Gas Association (annual convention), Cosmopolitan Hotel, Denver.

23 American Society of Safety Engineers (annual meeting), Conrad Hilton Hotel, Chicago.

23-24 Nebraska Petroleum Marketers (annual convention), Fontenelle Hotel, Omaha.

29-30 Independent Petroleum Association of America (annual meeting) Statler Hotel, Dallas, Texas.

NOVEMBER, 1956

1-2 SAE National Diesel Engine Meeting, Drake Hotel, Chicago.

8-9 SAE National Fuels and Lubricants Meeting, The Mayo, Tulsa, Okla.

8-10 National Oil Jobbers Council (annual meeting), Palmer House, Chicago.

12 API OIIC Steering Committee, Conrad Hilton Hotel, Chicago.

12-15 American Petroleum Institute (36th annual meeting), Conrad Hilton & Palmer House, Chicago, Ill.

25-27 Kansas Independent Oil & Gas Association (19th annual meeting), Broadview Hotel, Wichita.

26-30 National Exposition of Power and Mechanical Engineering (ASME), New Coliseum, New York, N. Y.

27-30 American Chemical Society (9th National Chemical Exposition), Cleveland, Ohio.

DECEMBER, 1956

3-4 New Mexico Oil & Gas Association (annual meeting), Alvarado Hotel, Albuquerque

4-5 Petroleum Packaging Committee, Hotel De Soto, Savannah, Georgia.

5-6 The Asphalt Institute (annual meeting), Site still unselected.

6-7 API Oil Industry Information Committee, Biltmore Hotel, New York City.

16-18 Kansas Independent Oil & Gas Association (annual meeting), Broadview Hotel, Wichita.

JANUARY, 1957

8-10 Kentucky Petroleum Marketers Association (annual meeting), Brown Hotel, Louisville.

23-24 Northwest Petroleum Association, Nicollet Hotel, Minneapolis.

FEBRUARY, 1957

26-27 API Division of Marketing (lubrication committee), Sheraton-Cadillac Hotel, Detroit.

MARCH, 1957

11-12 Illinois Petroleum Marketers Association (35th annual convention), Hotel Pere Marquette, Peoria, Ill.

14-16 Texas Oil Jobbers Association (annual convention), Rice Hotel, Houston.

20-22 API Division of Production (Southern District meeting), Washington Youree & Captain Shreve Hotels, Shreveport.

APRIL, 1957

10-12 API Division of Production (Mid-Continent District meeting), Mayo Hotel, Tulsa.

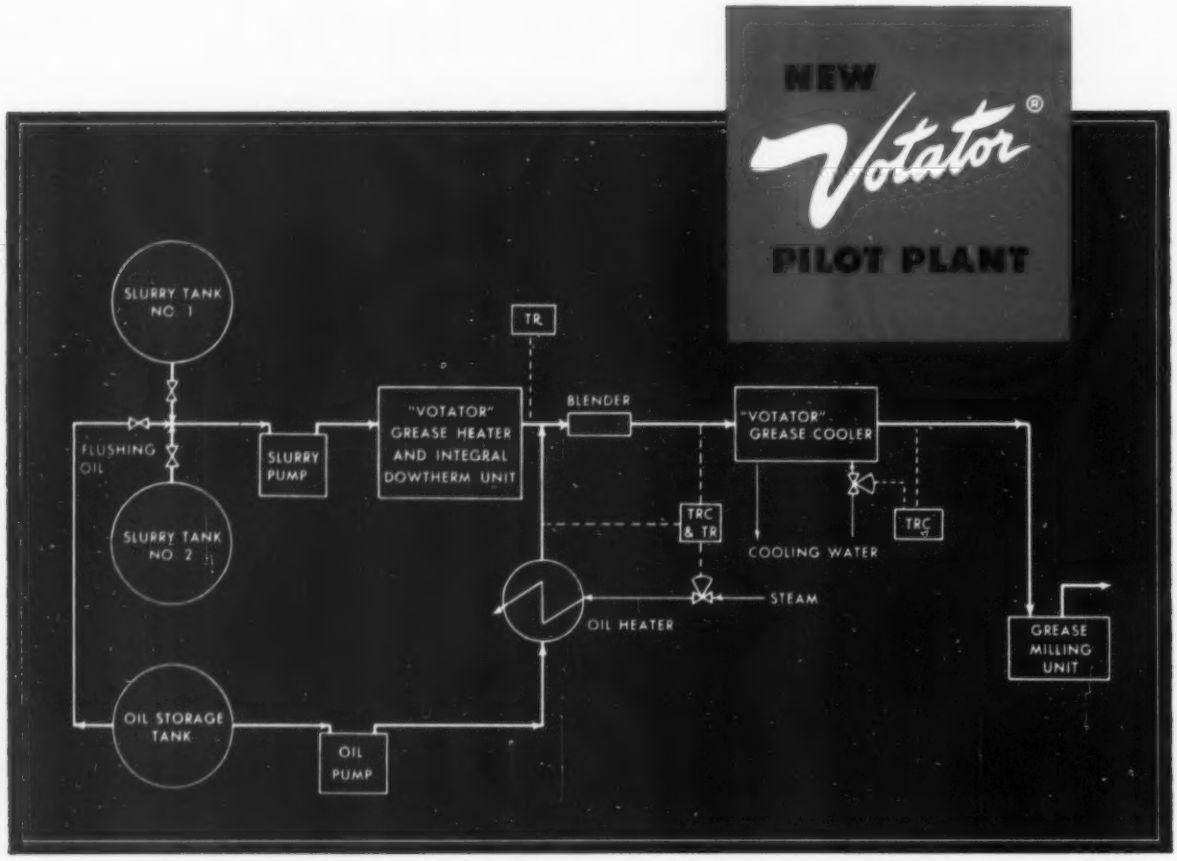
16-18 National Petroleum Association, Cleveland, Ohio.

24-26 API Division of Production (Rocky Mountain District meeting), Gladstone, Townsend & Henning Hotels, Casper, Wyo.

28-30 Independent Petroleum Association of America (midyear meeting), Buena Vista Hotel, Biloxi.

MAY, 1957

1-3 API Division of Production (Eastern District meeting), William Penn Hotel, Pittsburgh.



NEW Votator® PILOT PLANT

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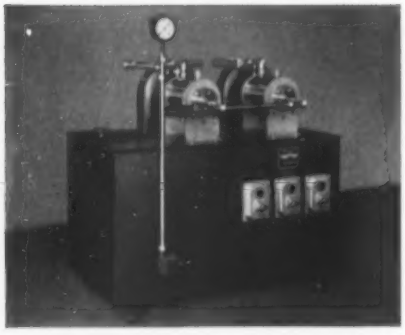

VOTATOR Grease Blending and Cooling Unit of grease pilot plant.

To help you develop improved methods and formulations, Girdler now makes available a complete, compact pilot plant for processing of lithium greases. This new VOTATOR* Grease Processing Equipment can also be used for small-scale, continuous production of specialty lubricants such as diesters and silicones. Schematic flow chart for the plant is shown above. Its features:

VOTATOR grease heater has integral electrically heated Dowtherm vaporizer.

All process variables such as temperatures and throughput rates can be changed in a few seconds.

Variable capacity pumps allow rapid change of slurry and oil ratios for easy study of various soap concentrations.

Variable drives on heater, blender and cooler permit easy study of processing alterations at all stages.

Write today for further information on this new VOTATOR Grease Pilot Plant. The Girdler Company, Votator Division, 224 East Broadway, Louisville 1, Ky.

*VOTATOR—Trade-Mark Reg. U.S. Pat. Off.

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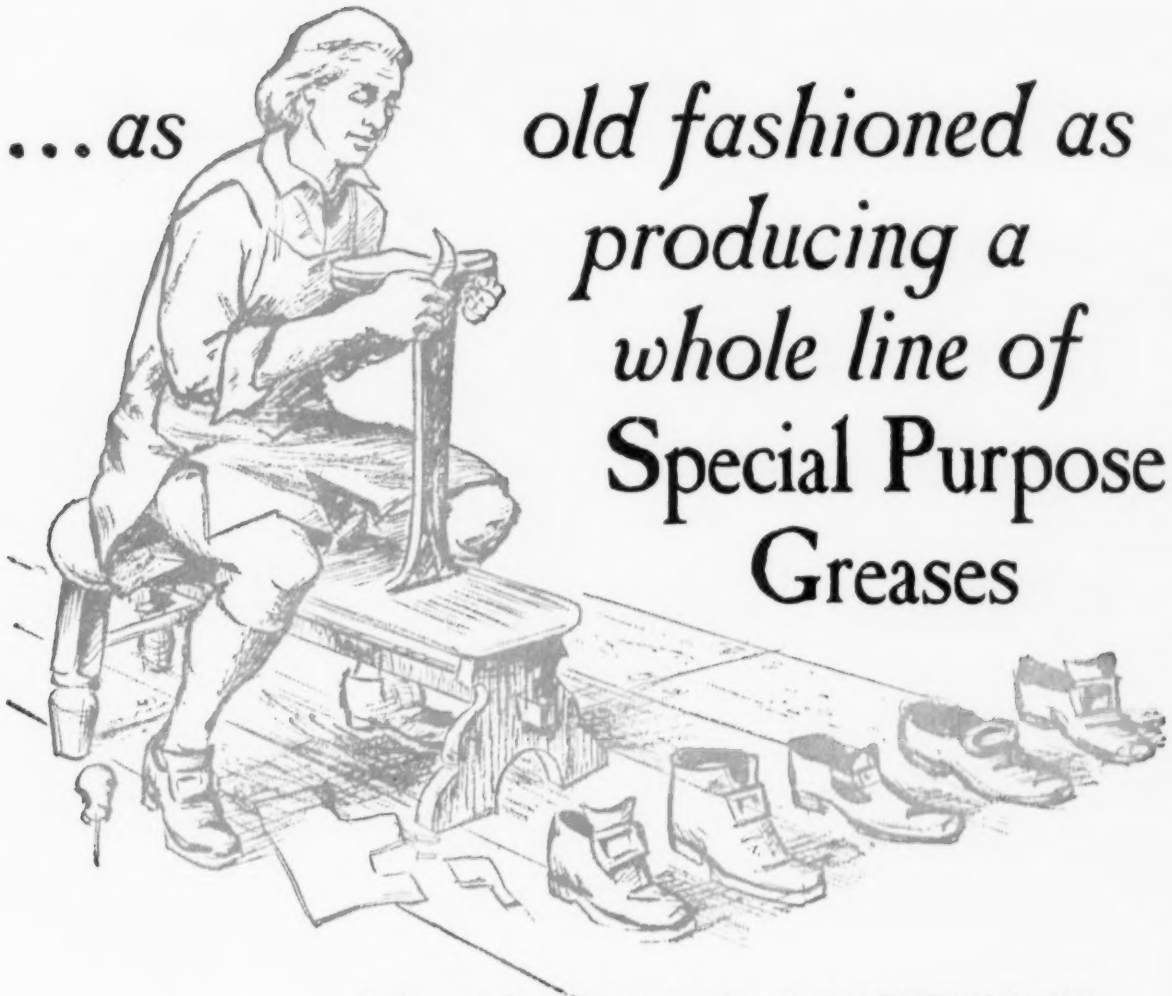
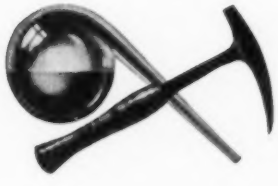


In the past decade the swing to a single LITHIUM MULTIPURPOSE GREASE* has introduced major economies throughout the industry —economies not only in manufacturing, but in inventory, handling and lubrication. Everyone benefits . . . and the possibility of misapplication is practically eliminated.

If you haven't discovered the manufacturing and marketing economies of producing a single LITHIUM MULTIPURPOSE GREASE, it will pay you to contact Foote for details.

* *Foote lithium chemicals are used as the base for a truly multipurpose grease that combines water resistance with effective lubrication in service at temperatures from —60°F. to over 300°F., along with other important qualities.*



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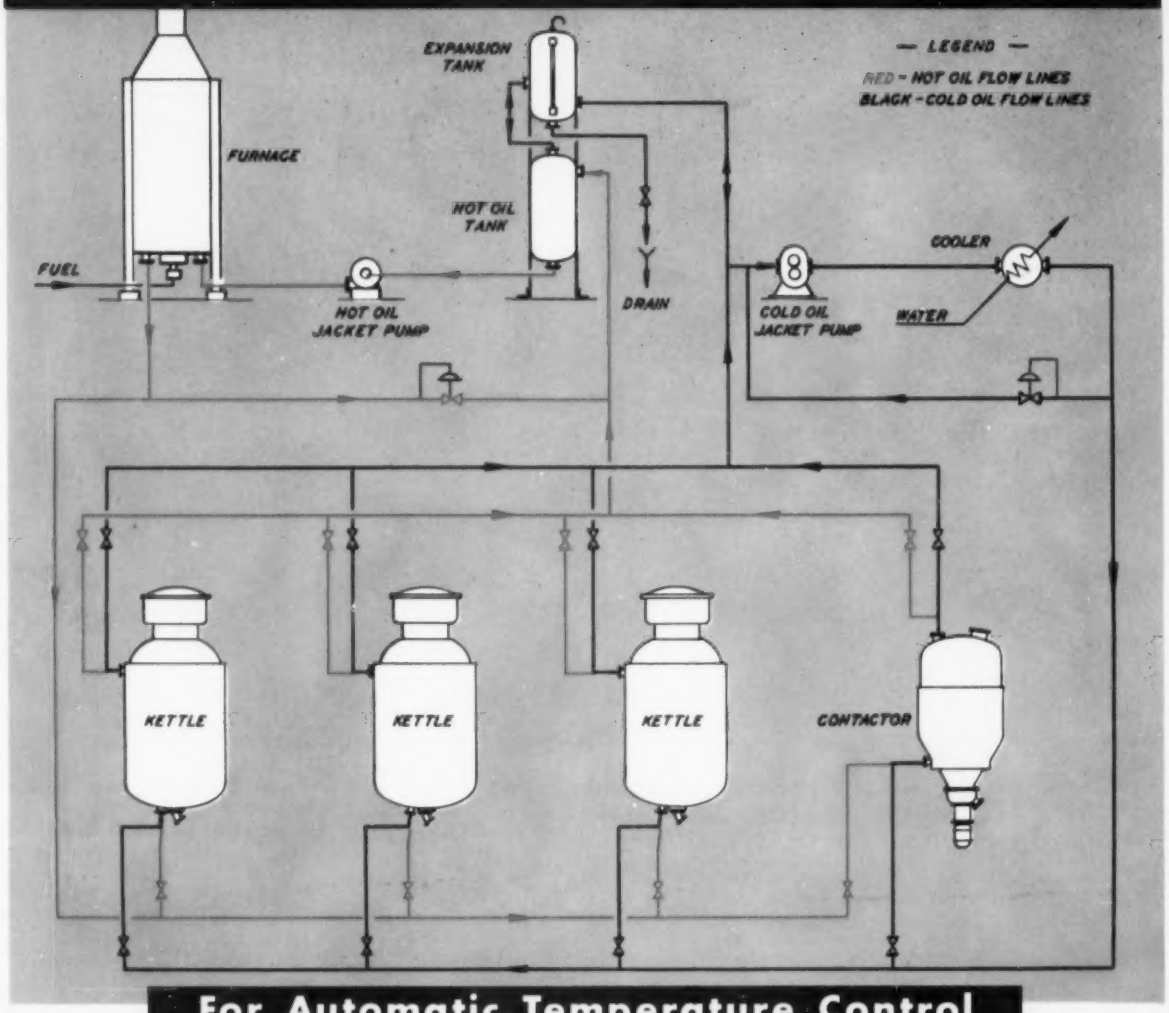

For Automatic Temperature Control

A completely automatic combination heating and cooling system using the same heat transfer medium.

Provides fully automatic control through all operating temperatures up to 600 degrees F., for grease making and other processes.

Instrumented to require no attendant.

Study the flow chart above. Write for detailed information.

*Patents Pending

STRATFORD ENGINEERING Corporation

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